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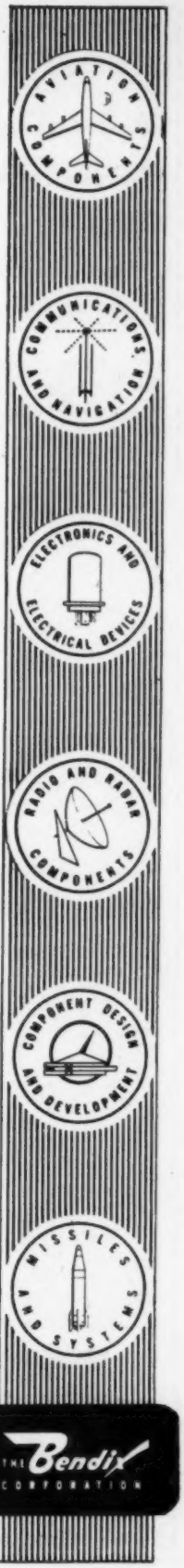

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The Justice of Progress

TIME has done epic justice to the Russian people in their launching of the first unmanned and manned space vehicles, for rocketry and spaceflight are Russian dreams come true. In 1881, while awaiting the day of his execution, Nikolai Ivanovich Kibaltchitch finished a manuscript entitled "Preliminary design of a rocket airplane." The circumstances are admirably related in Willy Ley's book *Rockets, Missiles and Space Travel.* Mr Ley goes on to record the work of the Russian schoolteacher Konstantin Eduardovitch Tsiolkovsky who, almost simultaneously with the German Ganswindt, made the first proposals for a rocket-propelled vessel for ascents beyond the outer layers of the earth's atmosphere. This was in 1895. In the 1920s we find that a Moscow student society was formed with the avowed purpose of advancing space travel. Its name was "World-centre of All Inventors and Scientists," and it was succeeded by the "Group for Investigation of Reaction Motion."

These historical facts have been little noticed by the daily Press in their otherwise generous acclamation of Russia's first manned entry into space, the story of which is told in this issue. It is one that has filled all races with the profoundest admiration. Rightly, the popular reports have given much credit to German techniques; but, as we have shown, Russia has long been actively space-minded. Possibly Prof Wernher von Braun was overlooking these facts when—it is reported—he declared that the Russians "did this to impress the African nations." The great adventure of Major Gagarin has, we believe, impressed the white nations equally.

The Major's Story

The technical achievement itself will remain a monolithic signpost in the progress of mankind. But it is Major Gagarin's own story, we believe, which will afford the greatest inspiration to coming generations. He himself has evidently been inspired by the writings of great visionaries. After his return to Earth he said, "I have read Jules Verne. He wrote, of course, in a most interesting manner. But it has turned out differently in life from his fantasies."

One wonders if the Major was remembering that Jules Verne's projectile, of American construction, was launched from the Cape Canaveral area. We believe not, for there is a simplicity and directness about his story which utterly shames some tendentious and cynical comments that came from people from whom one might have expected magnanimity. Perhaps the Russian cosmonaut's account received treatment at the hands of some Tass re-write man. We neither know nor care. The story has the impact of truth and wonder. "I saw for the first time," Gagarin relates, "the Earth's spherical shape. You can see its curvature when looking to the horizon. The view of the horizon is unique and very beautiful. The Earth is of a delicate blue colour. And this transition from the blue to the dark is very gradual and lovely . . . When I emerged from the shadow of the Earth the horizon looked different . . ." He goes on, "When weightlessness appeared I felt excellent. Everything was easier to perform . . . I felt fine . . . I could have gone flying through space as long as required . . . I was full of joy when I touched the Earth."

Of Project Mercury Gagarin said: "We shall welcome the successes of the American cosmonauts when they have flown. There is room in space for everybody. But we shall try to be always ahead."

This may contain an element of propaganda. It may not be great literature. But it is beyond doubt the literature of greatness.

FROM ALL QUARTERS

The First Astronaut

ON pages 522-524 of this issue *Flight* presents the most comprehensive account possible of the first manned orbit of the Earth—by Major Yuri Gagarin, of the Soviet Air Force, on the morning of April 12. There still remain many unanswered questions, and inevitably the Western writers who fabricate Soviet accomplishments and techniques have combined with reticence on the part of the Russians to give an overall picture which is far from crystal-clear.

Of the rumour that a Russian was launched into space, and not recovered, early in 1959, it can be said that this has no foundation in fact; likewise, the story of a Russian astronaut which excited the world's news-agencies on April 7 falls to pieces under a technical examination. On the other hand, there is reason to believe that the USAF radars located at Samsun (Turkey), in the Elburz mountains (north of Teheran) and north of Meshéd, Iran, did pick up the April 12 launching, as they do of all large Soviet vehicles launched from west of the Urals. As we go to press there has been no official statement by NASA, or any other Western authority, on whether Gagarin's single orbit was tracked by radar, apart from an announcement by Mr Salinger, President Kennedy's Press Secretary, to the effect that "American tracking information generally was in accord with what the Russians announced as far as the flight was concerned."

The unanswered questions are: what scientific information will be released concerning the flight; what was the method of recovery; and what was the path followed by the capsule? Much vital physiological data must have been gained, and it would strengthen the Soviet Union's position to publish it as soon as it has been reduced to an assimilable form. Of the method of recovery, the newspaper *Sovietskaya Russiya* wrote on April 14 that the major bailed out of his capsule and landed "on both feet" in a large field ploughed the previous day; a tractor driver is quoted as saying, "We found a very calm, handsome man . . . he had a watch on one wrist and a small mirror in the overall sleeve of his other arm." There is no tangible evidence to support the rumour that the space vehicle was aerodynamically controllable, although Gagarin himself said that it was undamaged and "could be used again."

Gagarin was flown to Moscow in an Aeroflot Il-18 on April 14, and was greeted amid tumultuous scenes at Vnukovo Airport, Red Square and the Kremlin. From the pioneering direct TV hook-up with the West, it could be seen that Gagarin bore himself superbly on an ordeal perhaps worse than his 108min orbit. But what of the story that the spaceship *Vostok* carried "not a single camera"; surely one recorded its occupant's facial expression? Why did Prof Blagonravov say that there was no window in its shell, and then say he meant there was no window in previous craft of the same design? And what sort of 65° orbit takes a man over S. America in 15min from Soviet territory and then allows almost an hour before passing over Africa en route for the landing in Russia?

Be that as it may, Major Gagarin has been made a Hero of the Soviet Union, has been awarded the title "First Cosmonaut of the Soviet Union," has a street named after him, is sitting for a bronze bust, will get a new flat in Moscow and has been invited to the premiere of the film "Master of the World" (Jules Verne) in Hollywood. Russia has claimed FAI records for height, load lifted and duration, and is to erect in Moscow a museum, with a 350ft obelisk, dedicated to space flight in the Soviet Union.

Cuban Airfields Attacked

THREE airfields in Cuba, two at the western end of the island, near Havana, and one at the eastern end, Santiago Airport, were subjected to rocket and bomb attacks by B-26 aircraft last Saturday. One of the aircraft, which had been damaged, landed later at Miami, Fla, and another at Key West. The aircraft were stated by Mr Adlai Stevenson, US delegate to the United Nations, to bear Cuban Air Force markings. In the attack, seven people were killed and 49 injured, according to Cuban Government figures. Pilots of the B-26s have asked for asylum in the United States, and their aircraft were impounded.

Republic's 30th Anniversary

REPUBLIC AVIATION CORPORATION produced its 24,478th aircraft on its 30th anniversary recently (Friday, February 17). Since its formation the company has built aircraft worth some $4 billion (the US billion, this sum representing about £1,228m). During the past six years Republic machines have achieved nine world speed records and captured eight major aviation awards. The company currently has 15,000 employees. The F-105Ds it is producing are to go into service this summer with the USAF in Europe.

Saab 105

TO be unveiled in model form at next month's Paris Show, the Saab 105 is a multi-purpose jet in the same class as the NAA Sabreliner, SAAC Execujet and DH.125. It will be powered by two of the Turboméca ducted-fan engines mentioned in *Flight* for August 14, 1959; this engine, which is also likely to be unveiled at Paris, has a design rating of 1,700lb (s.f.c., 0.59) and a cruising thrust of 419lb at 29,500ft (s.f.c., 0.88). "Thanks to this engine," say Saab, "the 105 will have exceptional range, as well as high speed." Seating up to five, it is intended mainly as a military or airline trainer (it will carry "a substantial weapons load"), but is also suitable for communications and executive transport.

F. E. N. St Barbe Retires

THE remaining active founder of the de Havilland Aircraft Co and youngest of the five men who formed the company in 1920 and directed its activities right through to the post-war years, Mr F. E. N. St Barbe retired from the board on March 31. The other four founder-members, Sir Geoffrey de Havilland, Mr F. T. Hearle, Mr C. C. Walker and Mr W. E. Nixon have all relinquished their directorships in recent years, Sir Geoffrey continuing as president.

Mr St Barbe, who had been a member of the Airco team before and during the 1914-18 War, went with D.H. to the new company at Stag Lane as business manager. For more than a quarter of a century he conducted sales of de Havilland products, building up the world-wide marketing organization which now serves Hawker Siddeley Aviation. He arranged the formation of the Australian company in 1927, the Canadian company in 1928, the Indian branch in 1929, the South African company in 1930, the New Zealand company in 1939 and the American company in 1953. For long periods he was a director of nearly all the home and overseas companies, and he was deputy chairman of de Havilland Holdings Ltd, the parent company formed at the end of 1955. He has served on the SBAC council and management committee, and as chairman of its sales and export committee for many years since the war.

PT6 Progress

EIGHT PT6 turbine engines are now running on the Canadian Pratt & Whitney Aircraft bench at Longeuil, Montreal, and total time is just over 1,000hr. Several 50hr tests have been successfully completed on bare power sections and on the helicopter version; military icing tests have been conducted at the NRC in Ottawa; and (see illustration) a turboprop PT6A-3 has been installed in a Beech 18 for development flying from St Johns, PQ. Later two turboprop versions will fly in a Queen Air. Military designation of the engine is T74. The T74-P-2 turboshaft engine has completed two preliminary flight rating tests and has been derated to 400 s.h.p. to suit entries for the US Army light observation helicopter competition. No firm application has been announced, but Hiller have installed a mock-up in a five-seat E-4.

TRIPLE-BEECH: de Havilland Aircraft of Canada have installed a PT6 500 h.p. turbine in the nose of a Beech 18 bailed from the RCAF, so that Canadian Pratt & Whitney can conduct test flying (see news-item)

SECOND PROTOTYPE Avro 748, which made its first flight on April 10, was inspected at the makers' airfield on the following day by Mr T. N. Kaul, Deputy High Commissioner for India (where the 748 is to be built under licence). In this picture are (l to r) Gp Capt H. Moolgavkar, Indian Air Adviser; Sir Roy Dobson, managing director, Hawker Siddeley; Mr T. N. Kaul; and Sir Harry Broadhurst, managing director, A. V. Roe

Battle of Britain "At Homes"

SIXTEEN RAF stations are to be opened to the public on the Saturday in Battle of Britain week, September 16. Under counties and countries, they are as follows:— *Berks:* Abingdon; *Kent:* Biggin Hill; *Devon:* Chivenor; *Wilts:* Colerne; *Norfolk:* Coltishall; *Rutland:* Cottesmore; *Yorks:* Finningley; *Warwicks:* Gaydon; *Durham:* Middleton St George; *Sussex:* Tangmere; *Lincs:* Waddington; *Cambs:* Waterbeach; *Scotland:* Leuchars; *Wales:* St Athan and Valley; *Northern Ireland:* Aldergrove.

September 15 is Battle of Britain Day, Battle of Britain Sunday falling on September 17.

IN BRIEF

The last operational Swift in the RAF, belonging to No 2 Sqn, was flown home from Germany to Manston last Thursday by Flt Lt P. Adair.

US Third Air Force have stated that they "can neither confirm nor deny" newspaper stories concerning closure or contraction of USAF bases in the United Kingdom.

Air Chief Marshal Sir Thomas Pike, Chief of the Air Staff, opened the new air terminal building at RAF Lyneham last Friday. The station is Transport Command's main base in the United Kingdom.

Mr Peter G. Masefield is giving his presidential address to the Aircraft Recognition Society on April 25 in the RAeS lecture theatre, Hamilton Place, London W1, at 7 p.m. His subject is *Civil Aviation: 1960 and the Future*.

Rolls-Royce Ltd are opening a new factory, to employ some 500 people, at Cadzow, about a mile from the centre of Hamilton, near Glasgow. This is part of their recently announced expansion scheme of design, development and experimental facilities.

Russian pilots are to accompany Indian aircrew in familiarization flights along the Sino-Indian border in the Antonov An-12s which India has purchased from the Soviet Union. The Prime Minister, Mr Nehru, said in announcing this decision that adequate precautions had been taken to see that no secret information leaked out.

A Hercules of the US Navy last week made the latest flight ever attempted in Antarctic winter, to bring back a seriously ill Soviet ionosphere expert from Byrd station to New Zealand. After the 6,500-mile trip the pilot, Cdr L. E. Newcomer, said that their first attempt to take off from the ice shelf was unsuccessful despite Jato assistance; the second succeeded "after taxying up and down the runway and taking on more rockets."

This year's National Gliding Championships at Lasham, near Alton, Hants, will be opened on May 13 by the Minister of Aviation, Mr Peter Thorneycroft. The Duke of Edinburgh is expected to visit the contest, and prizes will be presented on May 22 by Lord Brabazon. The British Gliding Association has received over 110 entries for the championships, and is limiting the number of contestants to 40 in League 1 and 50 in League 2. For the first time, there will be a handicapping system for League 2 gliders.

Two Boeing Vertol 107 helicopters have been ordered for the RCAF. They will be used for search and rescue and general duties.

The number of people employed in "aircraft manufacturing and repairing" in Britain during January was 294,300, an increase of 1,800 over the previous month's total.

The Society of Weight Engineers (London Branch) is holding a forum on *The Design, Manufacture and Operation of Aircraft*, at Lascelles School, Shaftesbury Avenue, Harrow, Middx, on April 28, at 7 p.m.

Mr H. C. Briggs has been appointed vice-president, Collins Radio International CA. In his new position, he will be European manager for Collins, stationed in London. He will have administrative responsibility for the English company, Collins Radio Co, and other European subsidiaries.

Marcel Hanriot, whose flying experience began when he flew his father's Hanriot single-seater monoplane solo at the age of 15, died recently at Nice at the age of 66. He served as a pilot during the First World War, being invalided out of the forces after a serious accident and subsequently retiring to Nice as a result of his war injuries.

A voluntary code of conduct to minimize risks associated with aerial crop-spraying has been prepared by the National Association of Agricultural Contractors for aerial spraying contractors and for ground organizations employing aircraft operators. It is being adhered to for a 12-month trial period.

Bell Helicopter Co is to produce a turbo-supercharged, three-seat utility helicopter which the company claims will have sea-level performance above 15,000ft at maximum gross weight. Designated the Model 47G-3B, the aircraft will be powered by a Lycoming TVO-435 with an AiResearch T-11 exhaust-driven supercharger, providing 260 h.p. for take-off and 220 h.p. for continuous operation.

Mr W. J. Andrews, chief engineer of the College of Air Training, Hamble, died suddenly on April 3 at the age of 62. Prior to joining the college when it was formed in May last year, Mr Andrews had been in charge of AST aircraft maintenance for over 30 years. He served in the RNAS during the First World War and in the early twenties was employed on aircraft maintenance at Broken Hill, Australia, helping to develop that country's internal air links.

THE MAGISTER MYSTERY: From a "Flight" reader in the Belgian Congo come these pictures of one of the two Fouga Magisters which caused an international stir when they arrived there in mysterious circumstances last month. The pilot in the right-hand picture is no less a figure than President Tshombe, who (says our correspondent) "is going to fly the jet trainer . . . a European technician is about to attach the oxygen mask." The pictures were taken at Luano Airport, Elisabethville, on April 8, on which occasion (again quoting) "the first Katangese Air Force pilot made his first solo flight, aboard a 90 h.p. Piper Cub." Shipment of the Magisters to the Congo was reported in our February 24 issue

Missiles and Spaceflight

MAN IN ORBIT

Major Yuri (George) Alekseyevich Gagarin is 27 years old. He is one of a number of Soviet "Cosmonauts," several of whom will probably make orbital flights during the next few months before starting a direct assault on space with manned flights well away from Earth

ON the morning of April 12 the Soviet news-agency Tass began to broadcast one of the greatest announcements in the history of mankind. The message began to come through at 07.59BST (one minute to ten, local Russian time) and opened in the following terms:

"The world's first spaceship, *Vostok* (East), with a man on board was launched into orbit from the Soviet Union on April 12, 1961. The pilot space-navigator of the satellite spaceship *Vostok* is a citizen of the USSR, Flight Major Yuri Alekseyevich Gagarin.

"The launching of the multi-stage space rocket was successful and, after attaining the first escape velocity and the separation of the last stage of the carrier rocket, the spaceship went into free flight on a round-the-Earth orbit. According to preliminary data, the period of the revolution of the satellite spaceship around the Earth is 89.1min. The minimum distance from the Earth at perigee is 175km (108.7 miles) and the maximum at apogee is 302km (187.6 miles), and the angle of inclination of the orbit plane to the equator is 65° 4'. The spaceship with the navigator weighs 4,725kg (10,416.8lb), excluding the weight of the final stage of the carrier rocket."

The fact that this announcement was by no means unexpected in no way detracted from its stunning impact on the entire world. Ever since Sputnik 1 went into orbit on October 4, 1957, manned spaceflight has been the obvious next major milestone, and the Soviet Union, largely as a result of greater available first-stage thrust and apparently excellent reliability, has placed in orbit a far greater tonnage than the US and has successfully recovered spacecraft of much greater size. The accompanying table (p. 523) includes all relevant dates.

As in all Soviet space launchings, no details have been given of the location of the firing, nor of the recovery area, neither have any particulars been divulged concerning the launch vehicle. The space vehicle itself is certain to be the same as that used in all the Soviet firings listed in the table since May 15, 1960. In addition to the five test shots preceding Gagarin's flight, the vehicle has undoubtedly been subjected to extensive static and systems testing, and the overall reliability of the entire booster and capsule appears to be remarkably high. The vehicle is considerably larger than the American Mercury capsule (*Flight*, February 12, 1960), which weighs some 2,100lb loaded, and may well be capable of accommodating two men without great modification, and can certainly carry very heavy instrument payloads.

According to the Russian announcements, the capsule had "a double wall of thin metal"—Mercury uses two layers of 0.1in titanium alloy—and the Cosmonaut was strapped to a contoured foam-rubber couch. It may be inferred that it also had a controllable retrorocket system, and a series of parachutes for final recovery. The launch took place at approximately 0907hr local time (0707BST), and one complete orbit was accomplished. The recovery sequence began at 1025hr local time. Two-way radio communications were established, three announced frequencies being 9.019Mc/s, 20.006Mc/s and 143.625Mc/s.

During the flight Maj Gagarin is reported to have radioed, "Flight is proceeding normally; I feel well" (over S. America at 0722BST) and "I am withstanding state of weightlessness well" (over Africa at 0815BST). The landing was made "safely at a predetermined spot in the Soviet Union" at 0855BST (1055 local time). Gagarin then said "Please report to the Party and Government, and personally to Nikita Khrushchev: the landing was normal, I feel well, I have no injuries or bruises." Prime Minister Khrushchev at once sent the following telegram: "I warmly congratulate you. I embrace you. Until our meeting soon in Moscow."

On April 13, before his triumphant entry into Moscow the following day, Gagarin was interviewed at length by Tass. The result was a unique narrative, in some places of a personal and recollective nature but in others containing straightforward descriptions of sights never before seen by man.

"I had," he said, "no feelings of loneliness in space. I knew well that my friends, the entire Soviet people, were following my space flight. I was sure that the Party and the Government would always be ready to help me if I found myself in a difficult situation. I felt fine, and could have spent much longer in the spaceship; but the duration of my flight had been fixed in advance.

"The sunlit side of the Earth is visible quite well, and one can easily distinguish the shores of continents, islands, great rivers, large areas of water and folds of the land. Over Russia I saw distinctly the big squares of collective-farm fields, and it was possible to distinguish which was ploughed land and which was meadows.

"Before this I had never been above 15,000m (49,213ft). From the spaceship satellite one does not, of course, see as well as from an aeroplane, but very, very well all the same. During the flight I saw for the first time with my own eyes the Earth's spherical shape. You can see its curvature when looking to the horizon.

According to the Russian caption, this photograph shows Gagarin still wearing his sky-blue spacesuit, and the wording even suggests that he is alighting from the capsule. In fact, he is descending from an aircraft—almost certainly an Il-14—and is wearing a fleece - lined leather helmet

"I must say the view of the horizon is quite unique and very beautiful. It is possible to see the remarkably colourful change from the light surface of the Earth to the completely black sky in which one can see the stars. This dividing line is very thin, just like a belt of film surrounding the Earth's sphere. It is of a delicate blue colour. And this transition from the blue to the dark is very gradual and lovely. It is difficult to put it in words.

"When I emerged from the shadow of the Earth the horizon looked different. There was a bright orange strip along it, which again passed into a blue hue and once again into a dense black colour. What struck me most remarkably was how near the Earth seemed, even from the height of 187 miles.

"I did not see the Moon. The Sun in outer space is tens of times brighter than here on Earth. The stars are visible very well: they are bright and distinct. The whole picture of the heavens is much more contrasty than when seen from the Earth.

"When weightlessness appeared I felt excellent. Everything was easier to perform. This is understandable. Legs and arms weigh nothing. Objects are swimming in the cabin, and I did not sit in the chair, as before, but was suspended in mid-air. During the state of weightlessness I ate and drank, and everything was like on Earth.

"I was working in that state, noting my observations. Handwriting did not change, though the hand was weightless. But it was necessary to hold the writing block, as otherwise it would float away from the hands. I was in communication contact on various channels, using a telegraph key.

"I was convinced that weightlessness has no effect on the ability to work. The passage from weightlessness to gravitation, to the appearance of the force of gravity, happens smoothly. Arms and legs feel as previously, the same as during weightlessness, but now they have weight. I ceased to be suspended over the chair, but eased myself into it.

"When I returned to the Earth I was overjoyed. I was warmly

met by our Soviet people. I was moved to tears by Nikita Sergeyevich Khrushchev's telegram. . ."

* * *

The first "Cosmonaut" is aged 27—the US Astronauts are now aged between 34 and 40—and initially was a pattern-moulder and foundryman by trade, graduating with distinction from the Lyubertsy artisans school near Moscow. Later he went to a technical college in Saratov, and then to a military aviation college at Orenberg. He is married to a medical graduate he met in Orenberg, and has two daughters, Elena and Galina. According to Prof Blagonravov he was a parachute instructor at Smolensk before being picked for Cosmonaut training.

Small chinks of light were permitted to escape through the black-velvet curtain shrouding Soviet spacecraft when Sovnews issued, on April 12, the text of a brief essay on *The First Manned Space Flight: Problems of Fuel, Precision and Re-entry*, by Prof Igor Merkulov. It read as follows:

"A spaceship designed for manned flight must meet stringent scientific and engineering requirements. This is particularly true of the means of propulsion and the instrumentation; that is, the automatic and telemetric systems for accurate orbiting and control of the ship in flight.

Fuel "To place a body in orbit round the Earth, it has to receive more than 3m tonne-metres [21,699m ft-lb—Ed.] of kinetic energy for every tonne [2,205lb] of its weight. The Soviet spaceship weighed nearly four and three-quarter tonnes. What does this mean in terms of actual energy? To perform enough work to get a spaceship into orbit would take a man handling heavy loads seven hours a day about 2,000 years. The rocket engines must do that work in a matter of minutes. These figures show the importance of choosing the correct fuel for the rocket engines.

"A second fuel problem is that of packing the greatest possible amount of fuel into the lightest possible containers. The weight of the fuel is more than one hundred times greater than the weight of the ship finally placed in orbit.* Thus multi-stage carrier rockets must accommodate hundreds of tons of fuel, with their dead-weight remaining as small as possible.

Precision "The launching of the rocket carrying the space vehicle requires great precision. In an orbit such as that flown by Yuri Gagarin, for instance, an error of 1° in direction or one per cent in speed could bring the ship back into the dense layers of the atmosphere on its very first orbit, and it would burn up.

Re-entry "In the three-and-a-half years since the launching of the first Sputnik, scientists all over the world have been discussing the vital question of re-entry. So far there is only one successful method of slowing down for re-entry.

"The braking motor [retro-rocket] is aligned so that, when the engine is switched on, the thrust is in the opposite direction to the ship's movement. In this way the thrust brakes the vehicle. This calls for a lot of additional fuel.

"The theory of rocket flight provides exact figures of fuel expenditure for specific acceleration or deceleration—theoretically there is no difference between the two. For instance, to effect a change of speed of about 300ft/sec, the amount of fuel used would be from three to four per cent of the payload. To reduce the speed by about 3,000ft/sec, the fuel required would be about 30 per cent of the payload, while to halve the speed would require almost four-fifths of the payload. Together with the fuel tanks and motor, this makes up some 90 per cent—leaving only one-tenth of the payload for the passenger and cabin.

"Estimates and experience show that the deceleration required for de-orbiting and safe re-entry is comparatively small, but if the ship should enter the dense layers of the atmosphere at near-cosmic speeds it would disintegrate like a meteorite.

Landing "Re-entry and safe landing pose many problems. A large amount of fuel has to be burnt to brake the vehicle and guide it safely through the atmosphere. But the slower the speed is reduced, the greater is the heat from friction, and the more cumbersome do the *ceramic* [our italics] heat shield and cooling system have to be. The engineer's task, therefore, is to produce a vehicle which ensures the lowest possible weight for all elements of the landing gear—the braking motors, fuel tanks, heat protection system, and so on.

"One method is the almost complete braking of the spaceship and then its parachuting to Earth, as is done with the geophysical rockets. The fuel expenditure for this, however, would be too great—so great in fact that it would take a multi-stage rocket to decelerate the ship, and that would bring down the weight of the passenger cabin to less than one per cent of the total payload. It has been found that the best results can be achieved by a combination of power deceleration with atmospheric drag, where parachute *or wings* [our italics] can be used."

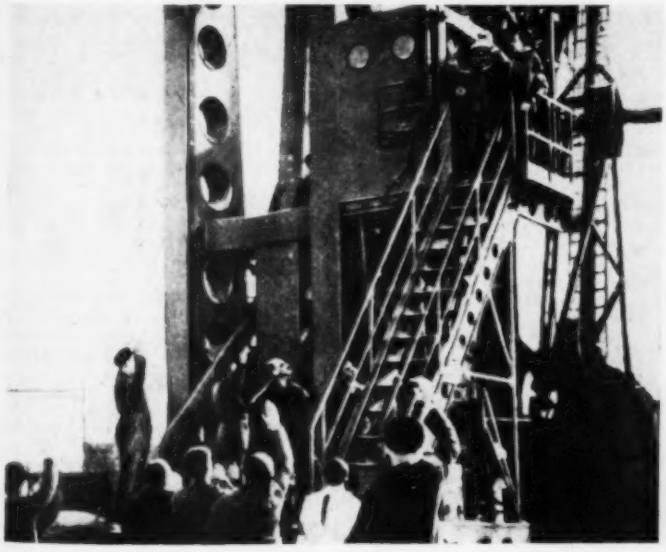
* *A high figure, suggesting a relatively low specific impulse; it implies a total launch weight of some 500 tons.*

SPACE TRAVELLERS

Date	Nation	Objective	Payload	Result
3.11.57	USSR	Recovery from orbit	Dog Laika	No recovery
13.12.58	USA	Ballistic shot (Jupiter C)	Squirrel monkey	No recovery
28.5.59	USA	Ballistic shot (Jupiter)	Two rhesus monkeys	Success
2.7.59	USSR	Ballistic shot	Two dogs, one rabbit	Success
10.7.59	USSR	Ballistic shot	Two dogs	Success
15.5.60	USSR	Recovery from orbit	Life capsule, dummy man	No recovery
19.8.60	USSR	Recovery from orbit	Two dogs, plus other specimens	Success
13.10.60	USA	Ballistic shot (Atlas)	Three mice, RVX-2A vehicle	Success
1.12.60	USSR	Recovery from orbit	Two dogs, other specimens	No recovery
31.1.61	USA	Ballistic shot (Mercury)	Chimpanzee	Success
9.3.61	USSR	Recovery from orbit	Dog, guinea pigs, etc.	Success
25.3.61	USSR	Recovery from orbit	Dog, other specimens	Success
12.4.61	USSR	Recovery from orbit	Man	Success

Note: The US Project Mercury schedule originally called for a manned ballistic (Redstone) shot in May 1960. In our most recent account of the programme (issue of December 2 last) we gave January as the expected date; today it is put at "April 28 at the earliest." A Mercury orbit is likely late this year.

There is no reason to doubt the authenticity of these two photographs, which were issued by Tass on April 16. The Russian caption to the picture on the left states that Gagarin is seen waving to the launch crew before entering the lift which carried him up the side of the huge boost rocket to the space capsule probably more than 100ft above. The smaller illustration, which shows details of his pressure helmet and what appears to be either microphones or the nipples of his liquid/solid feeding system, was made as he rode to the launch pad in a lowly bus



Missiles and Spaceflight . . .

APRIL 12 IN FLORENCE

At the Palazzo Pitti, Mayor Giorgio La Pira of Florence (left) congratulates Prof Anatoly Blagonravov of the Soviet Academy of Sciences on the historic Russian achievement. News of the COSPAR conference itself—which produced a wealth of new information—will be given in next week's issue

From Kenneth Owen of "Flight," Florence, April 12

IN the magnificent surroundings of the Palazzo Pitti in Florence, the big news spread quickly among scientists attending the second Space Science Symposium organized by the International Committee on Space Research (COSPAR). One of the first to be informed of the launching—by journalists seeking expert comment—was Prof Anatoly Blagonravov of the Soviet Academy of Sciences, leader of the Russian delegation to the meeting.

After checking on details by means of a telephone call to the Soviet Embassy in Rome, and accepting the excited personal congratulations of the Mayor of Florence, Prof Blagonravov attended a crowded press conference in the aptly named Red Room of the Palace. He began by saying:—

"A great amount of work was done by Soviet scientists and engineers in preparation for the first manned spaceflight, which was carried out today. It is well known that we have launched five spaceships to verify the air-conditioning, temperatures, and so on—in a word, to prove the normal living conditions for a man in the space cabin.

"We have also verified the communication system which permits us to judge about the condition, first of the dogs and now of the man in this cabin. Certainly our first concern was to provide the astronaut with a safe return to Earth, so that his spaceflight would not tell on his health. Our feeling was that the results obtained with the last spaceship, the fifth, made us sure that now we had all the conditions to carry out a successful manned spaceflight.

"Certainly it goes without saying, the astronaut had to be fully prepared for this flight. That is why, out of a great number of those who wanted to go on the first spaceflight, we have chosen several who with regard to health and training were prepared for flight. All these people underwent special training, technical as well as physical. They underwent training with regard to all the systems which were installed aboard the spaceship, and were prepared for small repairs to this equipment if necessary. In a word, we have organized special training courses for these people. Besides that, every day they made special physical training. They got acquainted with the conditions of weightlessness with the help of short flights.

"In a special cabin they underwent training with regard to high-gravity loads, temperatures, and so on. Besides that, all of them are good instructors of parachuting. They all of them have the ability of good co-ordination of their behaviour and their body in space. Thus we have provided for any possible or probable mistake, in case something went wrong.

"The results of the first manned flight have proved that this system of training was successful, because the first astronaut not only felt well during the launch into orbit (high loads, temperatures, weightlessness), but also he landed successfully.

"Now I can add some biographical details. His name is Yuri Gagarin. He is a pilot in the Air Force of the Soviet Union. He is 26 years old [he was 27 last month—Ed.], and was born in the Region of Smolensk. He is married."

Prof Blagonravov went on to answer specific questions. Those of us who had experienced the Professor's "answers" on similar occasions previously were not surprised to hear such statements as "the recovery was done in the same manner as it was done before in our first spaceships . . . the dimensions of the spacecraft are such that the astronaut could feel comfortable . . ." and other superb displays of diplomatic side-stepping.

But even the journalists were in a forgiving mood today, and the Professor rewarded us by letting slip some real items of information, such as the weight of the satellite (broadcast to the world from Moscow some hours previously), the fact that the astronaut could participate in the recovery operation to "a certain degree," and the fact that, on this trip at least, he had no scientific task to perform—the science was left to the equipment on board.

Why send a man up anyway, when instruments could do pretty well and were rather less fragile? "Yes, modern techniques can solve all problems which we put before ourselves. But I do not preclude, in the further development, that the participation of man may be of great importance independently of the perfection of the automatic equipment. We regard this achievement as the first step, and certainly this will lead to further results."

While we were still working this one out, someone asked the inevitable question—had the launching been timed to coincide with the COSPAR meeting? "Probably COSPAR has timed its meeting to coincide with the launching," Prof Blagonravov suggested.

One final question. Had there in fact been any previous attempt, successful or unsuccessful, to launch a man into orbit? The Professor looked *Flight* directly in the eye, and said firmly, "No. With the man it is the first attempt."

After the conference the leader of the United States delegation to the meeting, Dr. Richard Porter, obliged with a careful comment:

"Scientists of the United States will welcome this technological achievement by Soviet engineers and medical experts and by the Soviet astronaut, because it represents a further step in the exploration of space and will inevitably add to man's knowledge about himself and about the universe in which he lives. I am sure that this first step of man into space will inspire the minds of other men everywhere, and will lead to further accomplishments in engineering and science."

Prof Sir Harrie Massey, chairman of the British National Committee on Space Research, remarked that he was not surprised at the news. He had expected it "at any time" and it was an extraordinary technical achievement, particularly the successful recovery.

Many of us, indeed, had expected this achievement, but this morning we had been so busy noting the statements of the experts that we had not had time to sit back and consider the full implication of the actual news.

Now we recalled a white-haired professor, speaking quietly but proudly in the Red Room of the Palazzo Pitti, saying "His name is Yuri Gagarin. He is a pilot in the Air Force of the Soviet Union. He is 26 years old, and was born in the Region of Smolensk. He is married." And we realized that the new age was here.

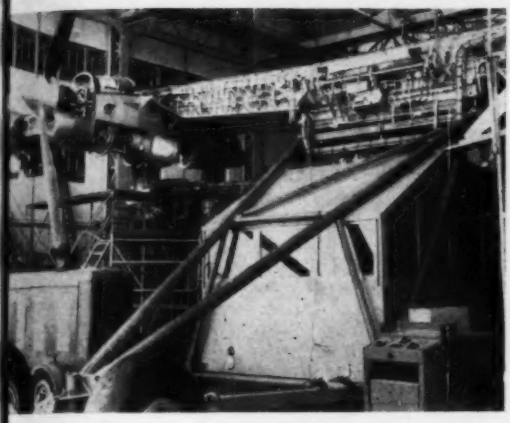
NORD REVEAL AS.12 AND AS.30

In a feature article on July 15, 1960, this journal published in some detail the family of air-to-air and air-to-surface guided weapons developed by Nord-Aviation. Two of the most important members of this family, and those most subject to security considerations, are the AS.30, and the AS.12 air-to-surface variant of the SS.12. Further details of both have now been divulged, prior to their exhibition next month at the Paris Salon.

AS.12 Originally this weapon was a direct outgrowth from the familiar SS.10/SS.11 anti-tank family, but it now appears to have at least as great a future in the air-to-surface role. Either wire or radio guidance is available, the radio equipment being identical with that developed for AS.20 and AS.30. First application is on the Breguet Alizé of the Aéronavale, which carries one missile under each wing. The AS.12 is 63in long, has a motor diameter of 7.1in (the 55.2lb warhead is of greater girth) and the cruciform of wings has a span of 25.6in. Launch weight is 165lb, and although ultimate range from a surface launcher is less than 20,000ft, this figure rises to 33,000ft total slant range when the missile is launched from an aircraft flying at 373 m.p.h. The AS.12 spins as it flies, and the two-stage solid motor confers a terminal velocity of about 435 m.p.h.

AS.30 In contrast, the rakish AS.30 has a burnout Mach number of approximately two, and a radius of action of approximately six miles. Essentially a scaled-up AS.20 (fully described in the *Flight* issue already mentioned), the AS.30 has a body with a length of 153.5in and diameter of 13.39in, and a cruciform of highly swept wings with a span of 39.4in; launch weight is in excess of 1,100lb. The AS.30 is guided by radio command, and will carry a tactical nuclear warhead when the French have developed one. Trials at Cazaux and Colomb-Béchar have mainly employed Vautours, which normally carry four wing pylons (for AS.30s inboard and AS.20s outboard). Other important applications include the Etendard IVM and the Mirage III.

1



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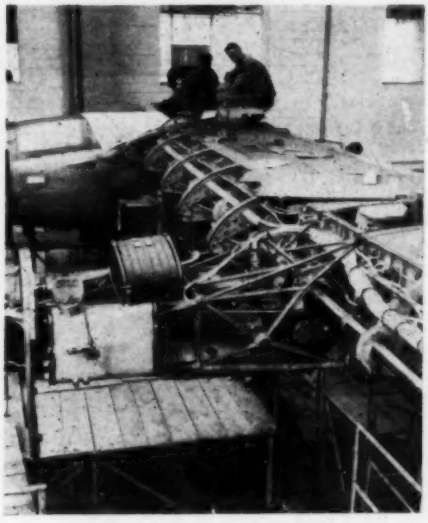


3

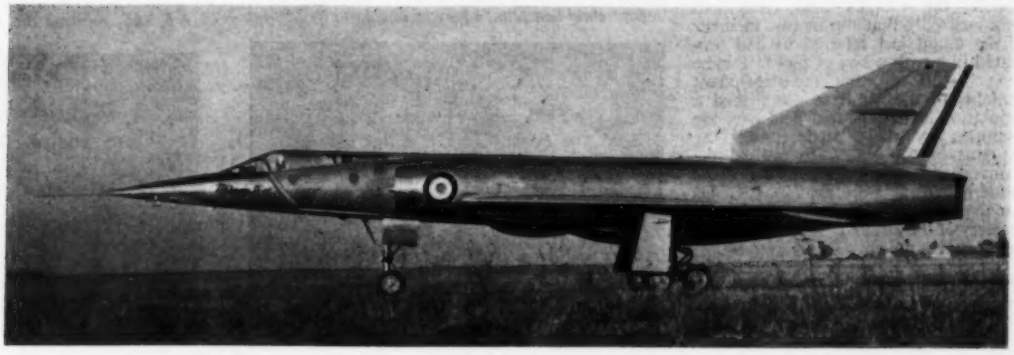
PROGRESS IN THE FRENCH INDUSTRY

4

ILLUSTRATIVE of the rapid and challenging progress of France's aircraft industry are the accompanying pictures of new aircraft now in the test and construction stage. Picture 1 shows the remarkable Breguet 940 prototype in which Bernard Witt is making some trial landings and take-offs. The man is standing where the aircraft touched down after an approach at 750ft/min rate of descent and 55kt. The aircraft is stopped a mere 35m further on. No. 2 shows the test wing of the 941 transport on its mobile stand, just before the engines were individually run without the coupling shaft. Note the section of shaft across the central propeller controls above the cabin and the part-cowled Turboméca Turmo IIID lying snugly under the propeller reduction case and oil cooler. Picture 3 shows the actual 941 wing (on April 6) with a transmission without Turmo in the foreground and the transmission shaft of the outer nacelle beneath the spanwise cable harness serving test instrumentation. The torsion box is a metal honeycomb integral tank.

Picture 4 is of the Dassault Mirage III O, powered by Rolls-Royce Avon, in RAAF markings and carrying two bombs and two tanks. Outboard pylons can carry Sidewinders. Picture 5 shows the Mirage IV prototype, now fitted with operational equipment, including a large radome ahead of the bomb fairing, and further radar in the nose. A cut-away drawing is on page 531.

5



GUILD BANQUET

The Air Pilots and Air Navigators Dine at Guildhall

Top, l to r, Capts M. R. Aries and B. C. Frost; Mrs M. R. Aries; Mrs B. C. Frost; Mr E. B. Trubshaw; Mr V. C. Varcoe; Mrs R. H. Studholme; Col Alderman and Sheriff R. H. Studholme; the Lady Mayoress, Lady Waley-Cohen; Mrs J. T. Percy; Rev Canon Leslie Wright; the Lord Mayor, Sir Bernard Waley-Cohen; Capt J. T. Percy; Sir Frederick Tymms; HRH the Duke of Edinburgh, Grand Master; Dr K. G. Bergin, Master; Mrs K. G. Bergin; Lady Tymms; Mrs A. K. Kirk; Mrs A. J. Majendie

L to r, the Master of the Guild, Dr K. G. Bergin; the Grand Master, the Duke of Edinburgh; Capt B. C. Frost; Capt J. T. Percy; Mrs B. C. Frost; Capt M. R. Aries; Mrs M. R. Aries; Mr A. M. A. Majendie; Mrs A. M. A. Majendie; Mr M. J. Aries

SINCE it became a City of London Livery Company five years ago the Worshipful Guild of Air Pilots and Air Navigators, a twentieth-century institution, has enriched the great mediaeval traditions in which the older Companies are rooted. At the Guild's annual banquet at London's Guildhall on April 11, attended by the Grand Master, HRH the Duke of Edinburgh, the Guild's members and guests—some 750 in all—experienced a pleasant blending of pageantry and purpose.

Indeed, the platitudes and complacent Blimpishness that "glittering occasions" sometimes evoke were entirely absent. The trophies that were presented, as depicted in the accompanying pictures, were a reminder that the Guild's members are foremost in the field of British action and achievement. The speeches were first-rate, and were made by men notable for their deeds and not just for their after-dinner words.

Sir Frederick Tymms, the immediate Past Master, thanked the Lord Mayor for the privilege of using Guildhall. He noted that the Guild was no longer the junior City livery company, having recently given place to the Tobacco Pipe Makers. His speech was short and just right.

The Lord Mayor, Sir Bernard Waley-Cohen, the Guild's host, remarked light-heartedly that the newest member of the Guild just referred to had presented him with a box of pipes. But he went on to say that the "merchant captains of the air have established a reputation as high as that held over the centuries by their predecessors, the captains of the sea." He praised the pioneers who, like Tymms, "flew before modern gadgets were available." This country held a premier place in the mastery of the air, and "a reputation for safety that is the envy of the nations."

Sir George Edwards of British Aircraft Corporation made one of his best speeches. Near him, he said, there were

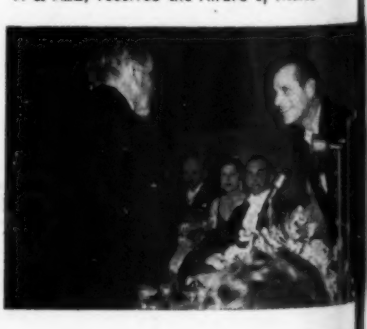
(*Continued on page 547*)

Air Cdre W. K. Stewart, commandant of the RAF Institute of Aviation Medicine, receives the Cumberbatch Trophy on behalf of the Institute

Capt J. S. Shephard, for 20 years commander of TEAL flying boat services, travelled from New Zealand to receive the Brackley Memorial Trophy

Mrs M. J. Lithgow receives the Derry and Richards Memorial Medal on behalf of her husband, Vickers' deputy chief test pilot, who was unable to be present

Gp Capt H. A. Purvis, test pilot at the A & AEE, received the Award of Merit



The Long View

SAE DISCUSS VTOL, SUPERSONIC AIRLINERS, AUTOMATIC LANDING

SAE members and guests were particularly interested in the talk given by Mr H. G. Conway on the Short SC.1. Here the aircraft is seen during its transition trials

A HIGHLIGHT of the recent National Aeronautic Meeting of the Society of Automotive Engineers—held in New York City's Commodore Hotel—was a luncheon speech given by Mr H. G. Conway, deputy managing director and chief engineer of Short Brothers & Harland Ltd. Entitled "The Development of a Research VTO Aircraft Directed Toward the Supersonic Transport," the presentation revealed many interesting details of the Short SC.1 aircraft. The development of aeroplanes that could rise from the ground like a bird without a long take-off run had been the inventor's dream ever since aviation began. But it had only recently been possible even to contemplate such a development in the high-performance aircraft field. Research aircraft had been built both in America and Europe to explore different methods of achieving this vertical take-off and landing. Great Britain's contribution to this work, according to the speaker, no doubt resulted from the skill of England's engine designers and the remarkable powerplants which they have produced. A direct result of their work had been the successful development of the SC.1, which made use of jet lift along what were "perhaps the most advanced lines so far attempted."

Mr Conway went on to say that the enthusiasm of the Short organization—and their belief in the ultimate workability of the aircraft—was, of course, understandable, but he had been somewhat surprised by public response to the demonstrations of the SC.1 at the last Farnborough Show. No small measure of credit for this was due to the polished flying of Tom Brooke-Smith.

The speaker next reviewed the origin of the SC.1. Noting that the beginnings of the jet-lift formula were made possible by the work of Dr A. A. Griffith, Mr Conway reiterated the simple premise that the "conventional compromises which had to be made to aeronautical design to enable an aircraft to be taken off and landed at reasonable speeds could be bettered if small jet engines, taking full advantage of the square/cube laws, could be used instead of extra wings, flaps, and so on."

The SC.1 had evolved out of a 1953 competition, and the initial contract with Short Brothers was placed in 1954. Some problems were encountered in clearing the aircraft for conventional flight, and at first in the development of the stabilization system which enabled it to hover. Difficulties were also met and solved in carrying out the transition from hovering to horizontal flight. The first transition was made in April of last year. Since that time no fewer than 150 transitions had been made by Brooke-Smith and three other pilots: "It can be said now that the tricks have been learned and the carrying out of transitions has been shown to be not particularly difficult, although the cockpit routine is still complex, and requires attention."

Mr Conway followed this appraisal with a brief explanation of why the "apparently ridiculous proposal of carrying around jet engines which operated only for a few minutes or even seconds during a given flight should be taken seriously." If it were accepted that jet lift of some type was the ultimate system for true VTO, and that for operational reasons a flat-riser was preferred over tail-sitters or inclined-attitude aircraft, then one was left with the choice of an engine which could operate either for lift *and* for propulsion or one where the engines were separated and only fulfilled a single function—*either* lifting or thrusting forward. For convenience, the two could be referred to as "convertible" and "separate" engine cases. Both systems were being developed in England. France and Germany, on the other hand, seemed mainly interested in the separate engine concept, in the opinion of the speaker.

The advantage of the convertible engine was *simplicity*, since the total number of parts would be considerably less than with a plurality of powerplants; however, the obvious advantage of the separate-engine scheme was that propulsion efficiency could be completely uncompromised, since it was not demanded of one engine to operate under two greatly differing modes of flight. Further, the separate-engine concept had significant benefits when one considered fuel consumption. Therefore, although the convertible engine might show some advantage as regards propulsive efficiency during hovering flight, this factor was more than offset by marked penalties in specific fuel consumption as cruise speed was reached. It was Short's experience, said Mr Conway, that aside from the short-range case—where the convertible engine showed up most favourably—the separate-engine configuration invariably produced a better design. There were certain complications with this arrangement, but the ability to suffer an engine-out inevitably made the designs attractive.

What had been achieved by the SC.1 project? Mr Conway remarked that the principal objective of demonstrating the feasibility of performing transitions from hovering to conventional flight and back to hovering had been proved. Much refinement in technique had yet to be accomplished, but solutions to the basic problems had been successfully demonstrated. In the course of the SC.1 programme, several additional important benefits had accrued: (1) the flight development of the Rolls-Royce RB.108 lift engine had been facilitated; (2) a satisfactory autostabilizing system, "with a proper degree of reliability," had been developed; (3) the development of suitable ground equipment had accomplished; and (4) the problems of ground suction, recirculation of exhaust gases, and soil erosion had been investigated. Details of technical features of the aircraft [*Flight*, June 10, 1960—Ed.] were also reviewed.

Mr Conway next went on to discuss military attitudes to VTO and STOL concepts (this section of his speech was reported in *Flight* last week—Ed). In closing, the speaker expressed his thanks for the opportunity of speaking before the SAE and his particular pleasure in talking about "ordinary aeroplanes." Some people, he opined, were sorry to see "space" as almost the sole topic of discussion these days: "Perhaps this is just being sentimental. But many of us feel we have a job to do getting reliable air transport organized between London and New York while others worry about Venus and Mars."

Perhaps Mr Conway's "sentimentality" is shared by many others, because a significant proportion of the SAE meeting—in contrast to many recent technical gatherings—was devoted to discussions about just "ordinary aeroplanes."

Mr P. W. Howson of Qantas Empire Airways delivered a treatise on *Piloting Techniques—the Changing Scene and its Associated Problems*. Since the most significant advances yet made in the air transport industry had been made in the past ten years, said Mr Howson, it was not altogether surprising to find that in certain technical aspects the industry was "creaking at the joints." These deficiencies had to be corrected before the world moved into the supersonic age. The problems could be grouped into five broad categories: (1) the manufacturer had to produce the proper equipment; (2) the airline operator had to make it work mechanically, train crews and introduce the aircraft operationally; (3) there was a need to appreciate the time required to train personnel; (4) it was necessary for the regulatory agencies to keep abreast of the changing scene and "be realistic in their licensing demands" as well as appreciating the need for automation to a large degree in the field of air traffic control; and (5) engineers skilled in the arts of human factors analysis had to assure that not too much was asked of the pilots who must fly the aircraft of the future.

The problems encountered in introducing today's subsonic types had proved that all new vehicles should be so designed that they could be mastered by the average pilot as opposed to the "super pilot." Pilots, said Mr Howson, were pushed to the limit of reasonable human expectation in the recent changeover to turbojet aircraft. While the number of incidents, or accidents, which could be said to be caused by "pilot technique associated with aircraft handling characteristics" had not caused a great loss of life, nevertheless the cost of equipment lost or repaired ran into many millions of dollars. The mere possibility of losing a $15m supersonic transport was a prospect that industry should not tolerate.

Mr Howson also took issue with those who propound the philosophy that the vehicle must be capable of being flown by the human pilot in all phases of flight. Envisaging supersonic aircraft fully coupled to ground-based electronic aids, he believed that there

would be no need to spend many expensive hours training pilots to master supersonic flight at 70,000ft. It might be hard to convince pilots that they could undertake without doubt or mental uneasiness a completely blind landing with fully automatic equipment. And there would be a particular reluctance among pilots, in the speaker's opinion, if automatic landing systems were not absolutely reliable when first introduced into operational service. Any unserviceability restrictions or reservations placed on the equipment in the early stages of pilot indoctrination would be disastrous; they would not only disturb public confidence in the vehicle, but would force the airlines into the unenviable position of trying to operate highly expensive equipment by means of old operational techniques and philosophies. Such a condition invariably led to accidents.

In closing, the Qantas representative noted an operational requirement which was considered essential for completely safe operation of modern aircraft. There was, he said, an urgent need for a take-off monitor for all large transport aircraft, particularly the jets. The take-off monitor was a "must" for the next generation of aircraft "and it is to be hoped that the reliability of jet engines stands us in good stead until such time as this equipment is developed and fitted. It is inconceivable that we should press on with the development of a highly sophisticated vehicle such as the supersonic aircraft unless we can solve the two fundamental problems of ensuring maximum safety during the critical stages of take-off and landing."

Big-jet Handling

One of the most interesting technical papers yet presented on the subject of supersonic transports—and one which gave keen insight into the problems of piloting the big American jets—was delivered by three men who must be amongst the world's most experienced jet transport pilots. The work, entitled "The Supersonic Transport: Pilot Views on Operational Goals, Handling Characteristics, and Related Subjects," was given by Capt W. W. Moss, one of PanAm's most qualified pilots, J. R. Gannett, chief engineering pilot at Boeing, and P. H. Patten, an engineering test pilot at Douglas. As the authors of the paper saw it, "the ultimate goal that we are all striving for is an aeroplane that can carry passengers from point A to point B with the ultimate of safety, reliability, punctuality, comfort, and economy at supersonic speeds." The handling characteristics of supersonic types was of vital importance and the purpose of the subject paper was to indicate some problem areas where attention to the piloting aspects could go a long way towards attaining the above simple objectives. Contrary to the ideas expressed by Mr Howson, it was the authors' contention that fully automatic control for a whole flight was at best years away—and was not really necessary, anyway. Human control of supersonic types should be perfectly feasible, since all flight below 35,000ft would be accomplished subsonically, because of noise difficulties. The authors warned, however, that although present stability and control criteria appeared to be valid "as far as they went," there were specific areas where one should endeavour to define additional suitable design objectives.

"Modern swept-wing jet aircraft have a tendency to exhibit poor low-speed lateral-directional handling qualities," continued the paper. Because of these characteristics, oscillations were frequently encountered during manœuvres, making the pilot's job more difficult. In answer to the question of what should be optimum lateral-directional control characteristics for supersonic aircraft, the following recommendations could be made: "Aileron control displacement and force should command roll-rate primarily. Elevator control displacement and force should define pitch-rate or an increment of airplane speed change from the original trim point. Rudder control displacement should define yaw rate or sideslip angle. Any noticeable amount of lag or overshoot after a control input in roll-rate, pitch-rate or yaw-rate detracts from good controllability and is very undesirable. The cross-coupling associated with the Dutch-roll mode is an excellent example of undesirable motion in any airplane." Pilots were, in the authors' opinion, "rather simple human beings" in that when they made a simple control motion they were most happy when the response was singular and proportional to the input. Control effects that caused lag, overshoot and cross-coupling were partially responsible for the problems frequently encountered by pilots of today's jet aircraft. "A moderately damped Dutch roll in the take-off, approach, or landing configuration is tolerable, but undesirable."

The authors observed that it was possible for a pilot to sit in a simulator and indicate his reaction to certain sets of stability derivatives and comment on their desirability; but it was quite another matter to witness the instinctive reactions of a pilot with 20 to 25 years of airline experience when he was making an instrument approach in rough air and had to land successfully and smoothly on a 150ft-wide, wet, slippery runway. "Under these moments of stress, the pilot reverts to instinctive and conventional control handling and the airplane must respond in an acceptable manner."

It was important that the designer should not settle for minimum acceptable handling qualities. It went without saying that linearity of response was important. Further, it was imperative that the pilot/aeroplane loop be made extremely tight, with no noticeable amount of lag or spurious aircraft motion introduced as a result of a control input. "With present jet transports, the engine locations on the wings, and the yaw-roll characteristic, introduce a situation which occasionally can be somewhat bothersome, particularly during an instrument approach. It is possible when all four engines are advanced simultaneously that one will put out more thrust than another, due to individual engine response and trim characteristics. Consequently a yaw motion was introduced, followed by the associated roll motion due to yaw, which was mentioned previously as one of the undesirable cross-coupled effects."

The condition was prevalent and especially undesirable during ILS approaches, when the pilot's attention was largely given to flight instruments and where thrust adjustments were usually made on a "feel" basis rather than by reference to engine thrust indicators. The result was that pilots in some cases never really had the opportunity to settle down directionally and had to make small bank angle and directional corrections which would not otherwise be necessary. The need for decoupling yaw from roll was quite evident.

The three authors next turned their attention to rudder requirements. The use of a rudder on today's jet aircraft was largely confined to three situations: (1) keeping the aircraft straight on the ground during take-off and landing; (2) kicking-off the drift during the flare for a crosswind landing; and (3) controlling the yaw due to asymmetric thrust (in the engine-out case). "The need for this precise directional control during landing and take-off has become more apparent recently because of the shortcomings of differential braking on wet runways and the poor effectiveness of differential reversing."

To the authors' way of thinking there was a tendency for the design engineer to satisfy the static control requirements without providing two very important additional features. One was to have sufficient excess control left over to satisfy the dynamic requirements which were always present in line operations, and the other was to have an aircraft response-rate which was capable of providing precise control. "The rudder is a prime example where excess control is required to cope with the dynamic conditions and the response-rate is of great importance to provide good controllability. It is one thing for an experimental pilot to take an engine-cut six or eight times a day in a test programme to demonstrate a given airplane. It is another thing for an airline pilot—who may never have had an engine failure on take-off except during training (where he was alert to the possibility)."

The case of two engines out on the same side (a rarity with today's engine reliability) posed special handling problems, in that when it did occur the pilot was called upon to perform a manœuvre which he did rarely—and then only in training. From long training experience it appeared desirable that the V_{MCA} speed with the two most unfavourable engines inoperative should not exceed the approach speed with full flaps.

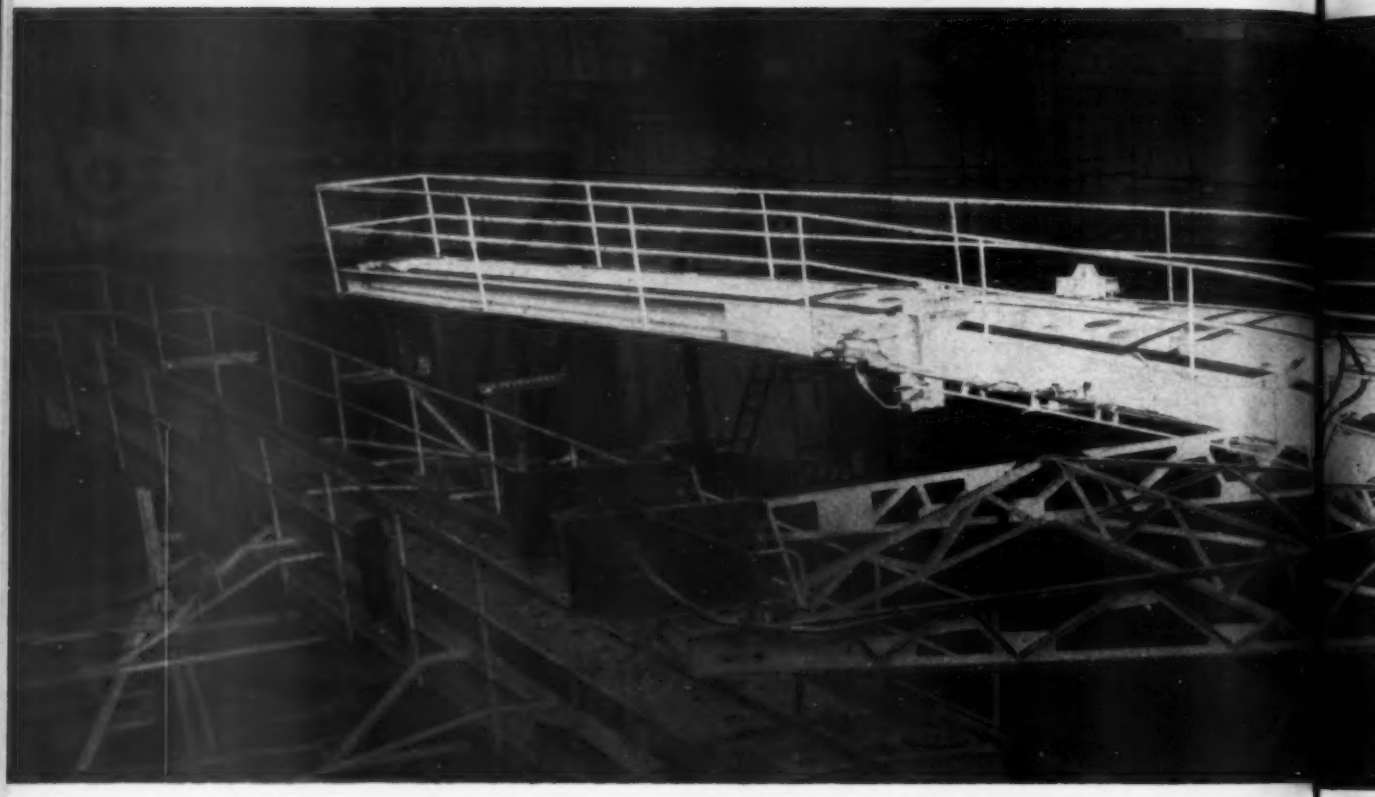
Control Characteristics

In general, the longitudinal control characteristics of present-day jets were quite good; however, the stabilizer-elevator relationship was worthy of comment. Under trimmed conditions there were no undesirable features, "but there have been incidents wherein the aircraft was misloaded to the point where it would not unstick on take-off with full-up elevator." During one incident it was necessary "to ease the elevator pressure and retrim the stabilizer hurriedly while progressing toward the end of the available concrete at 250ft/sec." After this hurried re-trim, a second unstick attempt proved satisfactory. "In a second case a normal lift-off was made, but immediately upon becoming airborne the aircraft assumed a progressively nose-up attitude in spite of corrective force of both pilots on the yoke and stabilizer control." Luckily the aircraft had been light and climbed rapidly until the crew was able to deduce that the stabilizer was trimmed fully nose-up. However, they were still unable to immediately re-trim the aircraft, because of the out-of-trim stabilizer-elevator relationship that then existed. Fortunately, one of the pilots then reduced thrust and allowed the nose to drop to the point where the aircraft could be appropriately trimmed.

According to the authors, another look should be taken at the requirements that pertained to the approach problem. "When the pilot wishes to increase his glide-slope angle he should be able to ease the nose down and accomplish just this. When he wants to decrease the angle he will instinctively raise the nose and he normally expects the airplane to attain a flatter approach. If other things happen, such as raising the nose causing a steeper approach angle, we have an obviously intolerable situation which could lead to nothing but disaster." Any reversal of conditions from normal piloting techniques were highly undesirable. The pilot must

"Don't
look now!
but there's an
AIREDALE
coming"

Smiths are in the picture



This is one of seven indicators in the VC.10 fuel load control panel which enable any desired weight of fuel to be selected for the tank concerned. These gauges automatically control fuel load in their respective tanks to pre-set quantities.

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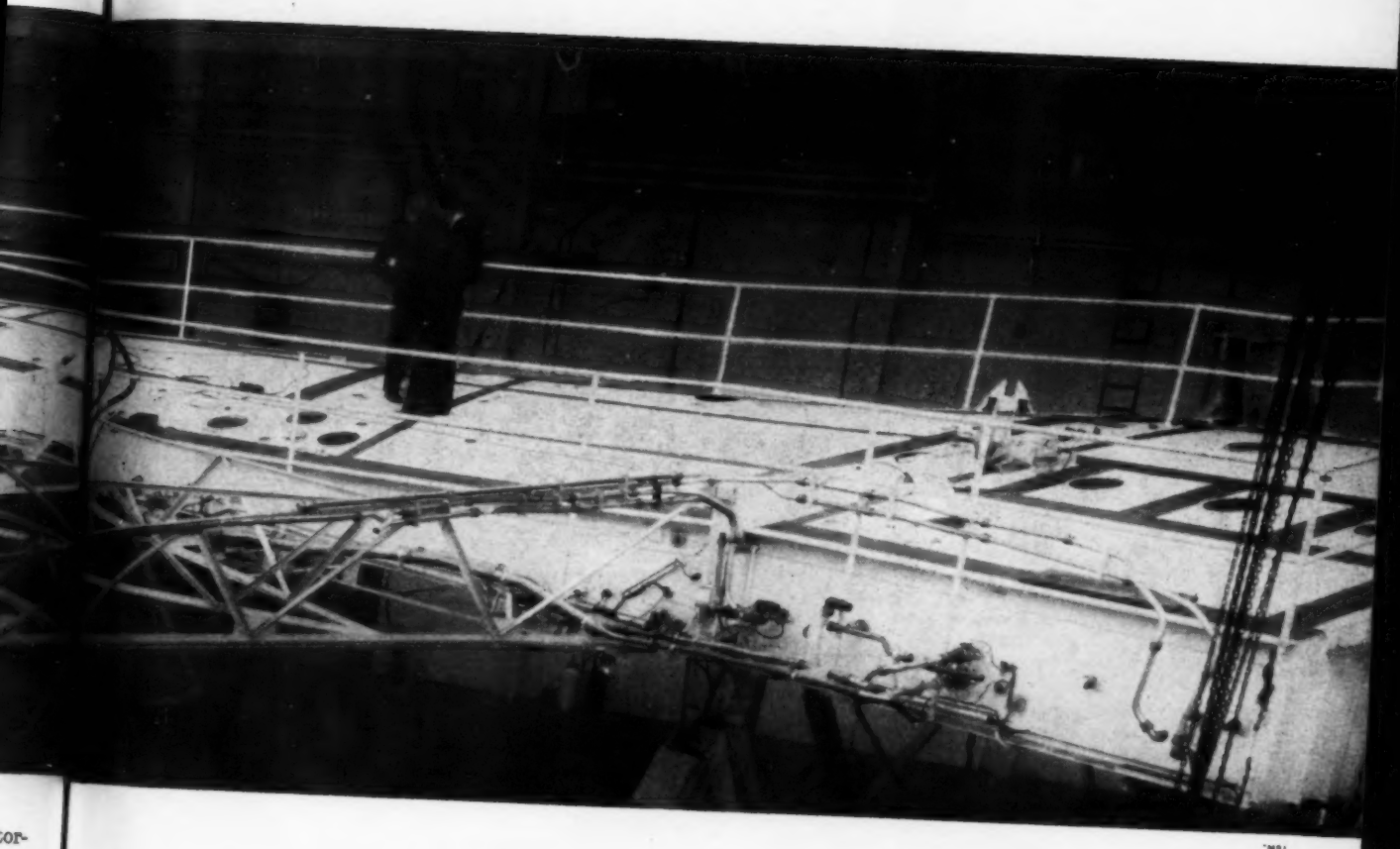

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THE LONG VIEW . . .

essentially be reckoned with in the "as is" configuration, and no reversal of control sensing should be expected of him.

In closing, the authors discussed the question of approach speeds and landing distances: "From current jet operations we know that it is possible to make consistently good landings with a threshold speed of 1.3Vs on a reasonably calm day if the approach is good with final sink, before flare-out, of not more than 700-800ft/sec. On the other hand, there is ample evidence that when the wind is gusty, when there is a marked wind gradient with height close to the ground, or when a high sink is involved, a 1.3Vs threshold speed is not sufficient to consistently prevent hard landings and undershoots." Two remedies for this situation were feasible. The first was to increase the threshold speed above the 1.3Vs value. Such a speed would, of course, have concurrent detrimental effects on ground roll-out. Another suggestion was to re-define stall speed to reflect a *practical* minimum level-flight speed. The speakers suggested that Vs be defined to be the minimum theoretical speed at which the aircraft could be flown steadily in level flight without the lift effects of the engines.

Ground roll distances, once touchdown had been effected, had been shown in practice to be 15 to 20 per cent in excess of certification distances. It was accordingly recommended that the CAR landing-field length should be no less than the ground roll stopping distance *without wheel brakes*. Additionally, the proposed new regulation should take into account that touchdown would occur 1,000ft from the approach end of the runway. "In any event, a criterion of this sort would place more design emphasis on the stopping capability on poor runway conditions. *This, in our opinion, is the missing link in the current design goals.*"

DON ADAMS

SERVICE HELICOPTERS: AUSTRALIAN ARGUMENTS

A TEXTBOOK case of how aircraft sales can really get fouled up is now in full bloom (to mix the metaphor as roughly as the events in the story) in Australia.

Last year the Federal Cabinet announced it would withdraw the active Australian carrier, HMAS *Melbourne*, from service in 1963, as it would be too costly to re-equip her with such modern fighters as the Etendard IV. (This was the first time a French aircraft had been considered for either of the Australian flying services.) The Cabinet later announced that *Melbourne* would be retained as a helicopter carrier. At that time the Royal Australian Navy had about £A4,500,000 to spend and required about 30 machines. Needing them in some hurry and having very little money, the RAN decided in principle on the Westland Gnome-Whirlwind. There is no question that this decision was taken within the Navy.

The Department of Defence, however, was keen that the Royal Australian Air Force, which had a small requirement for a helicopter to perform rescue duties, should order the same basic aircraft as the Navy. The RAAF refused to consider the Whirlwind, which was in general not the type required.

While this was going on, the RAN had done its sums again, to discover it had more money, largely from the schemes knocked back by Cabinet, and could actually risk an investment of £7m. The RAAF and RAN then came to a quick agreement on the Bell Iroquois. Bell is a big name in Australia. Ansett-ANA and Helicopter Utilities, two of the three main chopper operators, have small fleets of Bell 47s, while the Army had selected (and the RAAF bought for it) 11 Bell Rangers, which are now in the delivery stage. The RAAF and Army unit is now under training at Amberley RAAF Base, near Brisbane. The RAAF decided on eight Iroquois and the RAN on 28. The decision was taken and everybody along the line from Canberra to Washington was alerted for the project. Bell had the order all but in its hand. A press release was ready in Canberra.

Into this set-up jumped Admiral James A. Thomas, vice-president plans and programs of Kaman Aircraft Corporation. He arrived at Canberra with Mr Frank H. Horn, assistant field service manager. They went straight to the Defence Minister, Mr Townley, and (the story goes) to all intents and purposes told him that to order Bells without proper consideration of the Kaman Huskie was an outrage against humanity and economics. The Iroquois was promptly suspended. At the same time the local Westland agents, de Havilland Australia, weighed in with a complete project for an all-weather version of the Wessex, which they say could cost very little more than the Iroquois or the Huskie.

As at writing, the situation is that Defence are looking at the whole project again and will probably decide to send a small mission abroad before any decision is taken. The RAN is attracted by the Huskie's toughness and performance, but the Mickey Finn deftly planted in the mixture by Admiral Thomas was a proposal to have the Huskies assembled in Australia. This was clever. The Kaman organization is double, parts from one factory being taken to a second for assembly. To bring the parts direct to Australia and assemble them would cost very little, as the helicopters would need in any case to be partly disassembled in the USA for shipment and then reassembled by the RAAF. Kaman have been tentatively dealing here with Fairey and Bristol, both of whom have small plants at Bankstown. Bristol has been looking after RAN Sycamores and various Bristol Freighters, while Fairey have been looking after the RAN's Gannets. Either firm would regard the Huskie proposal as a godsend, particularly as there would be a first-class follow-up for parts and maintenance. As Kaman propose some 26 Huskies for the RAN and eight for the RAAF, this is a nice prospect. The RAAF, however, sticks by its liking for the Iroquois, but is not adamant against the Huskie. The trouble is that those RAN and RAAF pilots who have briefly flown the Huskie did not like it. For that matter they did like the Bell. Moreover, Kaman isn't even a name in Australia. One pilot had actually asked Admiral Thomas in Connecticut some months previously whether they had delivered any helicopters of any type to any Service anywhere. Kaman were upset.

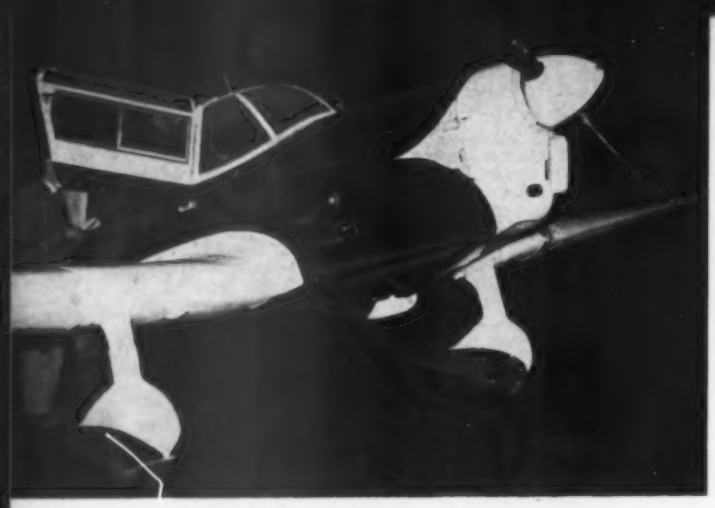
So, as of now, the RAN likes the Iroquois, is deeply impressed by the Wessex (all-weather and size), and finds it difficult to argue against the attractions of local assembly of the Huskie. Finally, I understand the Wessex could be assembled locally at the de Havilland plant at Bankstown and that a proposal on these lines has been submitted. But pity Bell's local agent, Frank Sharpe.

Now, just to make things clearer than the mixed metaphor at the start of this story, the Minister for the Navy (Senator Gorton) referred in a recent speech to the possibility that the old carrier HMAS *Sydney*, which has been on reserve for some years, might be reactivated as an assault helicopter carrier. This one has everybody guessing. If right, it would obviously double the chopper requirement, for the 30 or so designed for the RAN would serve for a carrier squadron and a shore-training squadron at Nowra, NSW. And the helicopter needed would have to have a double capability. This would put the Wessex well up into the picture, for size would then have a great bearing on the decision. Until this idea was conjured up, Australian naval requirements were for anti-submarine rôles only. The whole RAN exists actually for an anti-submarine task—nothing else. It is there to protect the sea-lanes, working with the RAAF. Until now there has been no question of giving the Army assault capability via the Navy.

Behind all this, the Australian Army is sitting with a quizzical look on its face. The Army's helicopter requirements are simply ignored. Like the armies of Britain and America it needs several sizes of helicopter. It has a small type by virtue of the RAAF order of Bell 47 Rangers, but its urgent need is a large type to give assault capability. It wants a few Boeing-Vertol 107s or Sikorsky S-61s, but it has no hope in the world of persuading the RAAF to agree to this. The Army cannot order aircraft and it in any case cannot operate any above 4,000lb all-up weight. The RAAF does not want a big chopper, and the Army cannot argue this. The funny thing is that the RAN really wants a big helicopter too—it is very keen on the Boeing-Vertol 107. But it has too little money to order more than just a few, which would leave many RAN pilots on the beach without a feather to fly. The RAAF will not buy a big chopper for which it has no requirement, but is willing to have more Hercules C-130s, of which it now has 12. The Army says it wants an aircraft which can operate off unprepared surfaces without damaging those surfaces. In actual fact, the Army wants something which is uncannily like the Rotodyne, provided some ferry range could be built into the design. In Australia we don't even know whether it will ever go into production. If it does, somebody ought to contact our Army (but only with the assurance that somebody else is buying it too; we don't like orphan aircraft out here).

I am led to understand that the reference to HMAS *Sydney* was merely a political kiteflying attempt and that this is not serious politics unless the South-East Asia kettle really starts boiling. We would then find an assault carrier a most attractive unit of the Australian Defence Forces. Should the Navy really be considering this, and if it has a chance in committee then the Army would certainly give its vote in favour at the Defence Committee meetings, for the Army is so hungry for airlift it will vote for anybody who will help. The Westland people ought to get behind this project with a big push. If the Navy wants this it should make some quick proposal, for Vice-Admiral Sir Roy Dowling, present chairman on the Defence Chiefs of Staff Committee, retires in a few weeks in favour of Air Marshal Sir Frederick Scherger. Instead of having two admirals on the committee, the Navy will have one, while the RAAF has two air marshals. I won't go as far as saying our Defence chiefs are biased; but human nature is human nature, only more so under a uniform.

STANLEY BROGDEN



Unloading G-AIEH at the conclusion of the return flight

BY PROCTOR TO ETHIOPIA

Trip to Africa in Search of Safirs

THAT the spirit of adventure has not departed from British private flying was well demonstrated by a recent trip by three Midlanders. The party concerned, all members of the Proctor Group operating from Baginton, were Denis Holmes, a Birmingham garage proprietor; Jim Hilton; and Geoffrey Grimmett, a Coventry solicitor. Their machine, a Proctor Mk 2, G-AIEH, formerly the property of Mike Dible, was stationed at Denham before acquisition by the Group.

Let Geoffrey Grimmett answer a few questions about the trip.

How about your Proctor? How many hours has it done, and what was the engine condition? It is, I believe, the only Mk 2 on the register. The last C of A was carried out at Denham by Marshall Dunn Aero Services. I cannot recall the exact number of hours the airframe has flown, but there are now about 100 hours left on the engine. The total trip to Ethiopia took about 80 hours off the engine life.

What was the purpose of the trip? We had seen an advertisement for a number of Saab Safirs for sale through an English agent. We checked on this and found that they were actually in Ethiopia. You will recall that the Safir is a three-seater tricycle-undercarriage machine, these particular ones having Gipsy Major engines. For this reason they seemed very suitable for club use and we were interested in buying one or all of them and bringing them back.

What radio did you have, and did all of you have radio licences? The aircraft is fitted with a Murphy MR8B 23-channel set, and we found this very adequate. The only thing we missed when we got abroad was ADF; parts of the trip were to be made more difficult by not having this facility. Some controllers were diffident about letting us take off because we had no radio compass at all. All of us have the restricted radio licence.

How complicated was the route planning, and how long did it take? We spent about three weeks obtaining visas, route planning and being jabbed by the doctors. The last seven days were spent in full-time preparation. The African visas were the main difficulty. It was necessary to have a visa to go through Libya, a visa to go into the United Arab Republic, a visa to go into the Sudan, and a visa to go into Ethiopia. The Sudanese visa could not be issued until we had our Ethiopian visa, and that could not be issued because of political disturbances there. Eventually we had to go on to Cairo, hoping to get our visas when we got there, which of course we did.

When did you take off and at what time? We finally got airborne at 1200hr on Christmas Eve—somewhat delayed because the fuel carnets for 1961 had not arrived in Birmingham and it was necessary to go over there during the morning to collect them from Shell House. Take-off weather conditions were doubtful, but we climbed and got VMC on top. Southend was our first objective; we requested two QTEs to fix our position and then Southend brought us in on a series of QDMs. The Proctor broke cloud at about 550ft, just over the airfield. At Calais things started to go wrong because control there did not want us to carry on, being mainly concerned that we might go to Le Bourget. Eventually we promised that we would go elsewhere and booked to Beauvais. We hopped over the hills with only minimum clearance, then went through to Meaux, outside Paris, where we stayed the night.

We went from Meaux to St Yan and thence to Lyons. On this last leg we came nearer to disaster than on any other part of the journey. Prior to take-off we were told that the weather was OK and that we would have 1,500ft and visibility of one mile; in fact we went VMC on top from St Yan over the mountains and had to let down through cloud into the Rhône Valley. Our height was only 400ft when we sighted the ground. It was necessary to follow the road all the way down to Lyons. At 300ft the houses along the river and on the sides of the hills were higher than we were; there was also a television mast to be avoided. We would never have taken off to go there had the met. forecast been correct. One amazing revelation came when we called Lyons Control and asked for a QDM—they told us that they had no direction-finding equipment. We asked for a radar approach; but they had no radar either, so we had to find our own way in. It seemed fantastic that a place of that size should have had no radio aids at all.

Between Lyons and Nice, where there was snow on top of the mountains, we had our first glimpse of decent, clear weather. We stayed the night at Nice before take-off the next morning for Ajaccio. Before letting us go, the French authorities confirmed that we had Mae Wests and two-way radio capable of maintaining communication throughout the trip. This was December 28, and the weather was still good.

I suppose your cruising height depended on the weather? The economic cruising height of the Proctor is 6,000ft. From Baginton to Southend we had flown at about 4,000ft on top, and that was about the highest we reached until we got into Africa. Most of the time we flew at 1,000ft in contact. We intended to put down at Cagliari in Sardinia after leaving Ajaccio, but we had sufficient fuel and so overflew to Tunis. It was dusk by then, and Customs and other formalities occupied about three hours; after that we took off in the dark and flew down to Tripoli. Tunis were unhappy about our having only VHF, but they let us take off and we found Tripoli without difficulty with the aid of American radar at the other end. On this leg there was no horizon and again we flew completely blind from Tunis to Tripoli. At about 2,000ft ground contact was lost and we saw nothing until Tripoli came up. There we landed in a sandstorm. I was flying on that leg and asked for a QFE on the approach; but they gave me a QNH, which meant that we landed rather sooner than expected. It was only in the very last minutes before touchdown that I realized we were so close.

STAGE TIMES OUT AND HOME

Date (1960-61)	Take-off	Touchdown	Duration (hr)	(min)	Stage
24.12	1235	1325	0	50	Baginton - Southend
24.12	1550	1620	0	30	Southend - Calais
26.12	1045	1200	1	15	Calais - Beauvais
26.12	1445	1515	0	30	Beauvais - Meaux
27.12	1250	0250	2	00	Meaux - St Yan
27.12	1515	1605	0	50	St Yan - Lyons
28.12	0955	1140	1	45	Lyons - Nice
28.12	1315	1430	1	15	Nice - Ajaccio
29.12	1225	1500	2	35	Ajaccio - Tunis
29.12	1715	1945	2	30	Tunis - Idris
30.12	1135	1345	2	10	Idris - Marble Arch
30.12	1415	1630	2	15	Marble Arch - Benina
30.12	1830	1945	1	15	Benina - El Adem
31.12	0815	0940	1	25	El Adem - Mersa Matruh
31.12	1110	1315	2	05	Mersa Matruh - Cairo
2.1	1245	1455	2	10	Cairo - Luxor
2.1	1700	1905	2	05	Luxor - Wadi Halfa
3.1	0500	0745	2	45	Wadi Halfa - Atbara
3.1	0840	1050	2	10	Atbara - Kassala
3.1	1120	1245	1	25	Kassala - Asmara
4.1	1415	1645	2	30	Asmara - Dessye
5.1	0500	0630	1	30	Dessye - Addis Ababa
5.1	0830	0850	0	20	Addis Ababa - Bishoftu
7.1	0410	0630	2	20	Bishoftu - Gondar
7.1	0720	0910	1	50	Gondar - Asmara
7.1	1150	1310	1	20	Asmara - Kassala
7.1	1330	1520	1	50	Kassala - Atbara
8.1	0525	0820	2	55	Atbara - Wadi Halfa
8.1	0920	1150	2	30	Wadi Halfa - Luxor
8.1	1240	1515	2	35	Luxor - Cairo
9.1	0940	1200	2	20	Cairo - Mersa Matruh
9.1	1300	1445	1	45	Mersa Matruh - El Adem
10.1	0450	0700	2	10	El Adem - Benina
10.1	0818	0943	1	25	Benina - Marble Arch
10.1	1030	1340	3	10	Marble Arch - Tripoli
11.1	0545	0815	2	30	Tripoli - Tunis
11.1	1015	1315	3	00	Tunis - Ajaccio
11.1	1400	1515	1	15	Ajaccio - Nice
12.1	0745	1000	2	15	Nice - Lyons
12.1	1150	1450	3	00	Lyons - Calais
12.1	1525	1655	1	30	Calais - Elmdon
12.1	1750	1800	0	10	Elmdon - Baginton

Proctor's crew: left to right, Messrs Hilton, Holmes and Grimmett

At Tripoli the RAF gave us a splendid welcome and put us up in the officers' quarters. They seem prepared to welcome any private flyer who goes over there and to put him up very cheaply and comfortably. Benghazi, our next objective, involved taking petrol in the cabin and landing halfway on the airstrip at Marble Arch (which is now disused) for refuelling. By now the weather was very good indeed and we cruised at 6,000ft.

How were you received at Addis Ababa? They welcomed us, although they were rather amazed to think we had come all the way from England in the Proctor. In fact, they were disbelieving to a certain extent, but we had paperwork to prove it; and they were expecting an aircraft with our registration number, so they had to believe us. Getting into Addis was quite a problem; the minimum safe altitude over the mountains is 12,500ft and our service ceiling was approximately 13,000ft. However, we did struggle up to 13,000ft and clear all obstacles. Addis is 7,000ft above sea level—close to 8,000ft actually; and at that altitude, in the heat, landing speed goes up quite a bit. Moreover, the power of the engine was so much less that both landing and take-off were, from a private pilot's viewpoint, quite a hazardous operation. For take-off we normally use 2,400 revs and $-\frac{3}{4}$ boost. Here I think we managed to get pretty well the full revs, but boost was something quite fantastic, -3 or -4. We utilized the runway at an alarming rate.

In Ethiopia we came near to our second catastrophe. Flying from Asmara to Addis, we wanted to land at an airfield by the name of Hawash. The mountains lost us our radio contact with Asmara until we were about 20 miles away. Then an airliner intercepted us on the radio and repeated an important message from Asmara to the effect that the airfield at Hawash was unserviceable and would we please divert to Dessye. There was some difficulty in finding Dessye, which is in the mountains and hardly recognizable as an airfield. There we had a choice of landing either downhill and into wind, or uphill and downwind; we chose the former. Jim Hilton was pilot at the time; although he touched down within feet of the starting line, we were still rolling dangerously at the other end and had to open up and go round again. This time Jim virtually stalled-in on his approach, but we just made it. Somebody told us that unless we took off at 6 o'clock the next morning we should not get away with our weight and load. Here it was compulsory to have a guard for the aircraft—whether for protection from wild animals or from human beings we do not know—but it was quite cheap at 3s for the night.

How about the aircraft you went to see? They were all in pieces. The wings were away from the fuselage and the engines away from the airframes. Most of the wings themselves had been stripped down. We had been promised that the aircraft were in flying condition and ready for delivery; in fact, at one point we had considered buying them out there and flying them home. It was very lucky that we did not take this idea too seriously. I rather doubt if they have been rebuilt yet.

On reflection, do you have any comments which might interest other pilots making a trip of this kind and in this region? Yes, one thing that hurt our pockets was that we had to fly through the Malta Flight Information Region. Even if you do not contact Malta at all, there is a charge of £2 per flight. Since Malta FIR is quite a fantastic area, we did four hops going out and four hops coming back. The bill for £16 came in quite recently. On this same subject, it is terribly expensive to fly through the Sudan. There is a landing fee, an internal flight fee, and an international flight fee; and, if you allow the natives on the airfields to push steps towards the aircraft, there is a handling charge as well.

I would like to pay tribute to the Shell organization. They deserve a word of praise, for their handling facilities and supplies were very good all the way through; in fact, that was about the only satisfactory thing about some of the airfields.

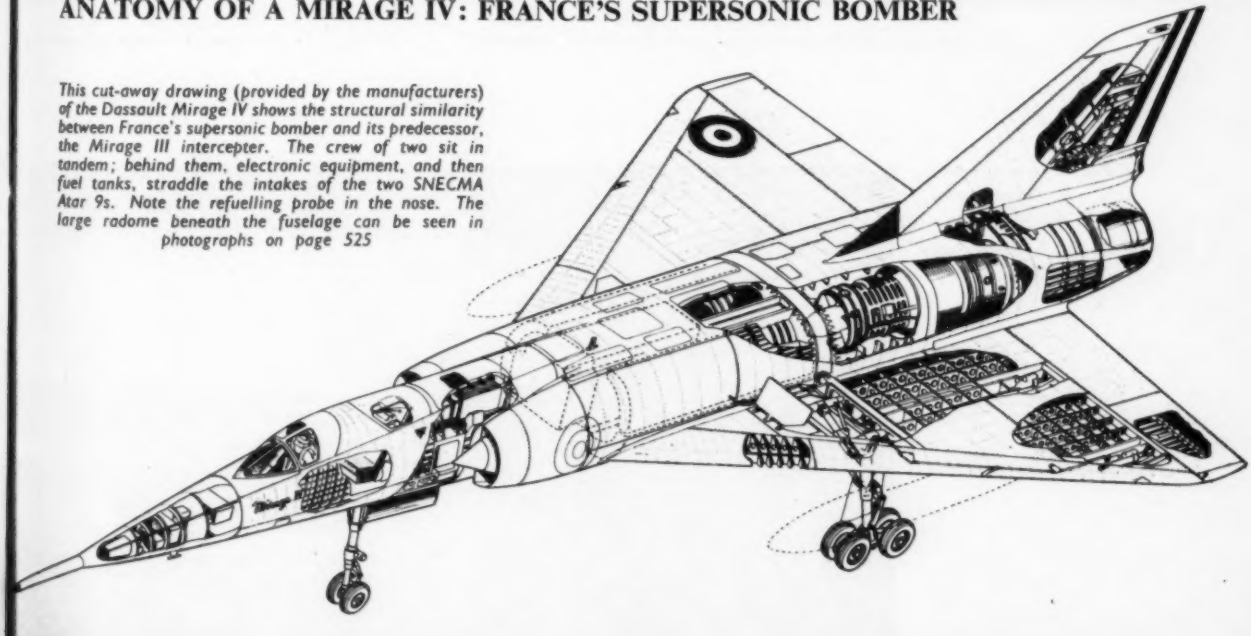
How long were you away altogether? We went on December 24 and came back on January 12. As a matter of interest, we took off on Christmas Eve and were in Ethiopia for Christmas Day, because their Christmas Day is on January 7, as they work on a different calendar.

Finally, were you quite happy about doing long sea crossings in single-engined aircraft of the age of the Proctor? Well, we came to the conclusion, especially in Ethiopia, that there are far more dangerous places in which to come down than in the sea. We had no troubles whatsoever with the engine; in fact, the only thing to go wrong was one of the artificial horizons, which went unserviceable at Tripoli. The RAF kindly lent us a new one until we got back there. From then on we had to manage without an horizon, which was a bit hazardous, especially as it was necessary to fly through fog to VMC on the way to Lyons. Apart from that the aircraft behaved very well indeed, although it was well and truly loaded with spares. We had a spare petrol tank, magneto, wheel, and set of plugs and contact breaker points, and lots of tools. None of these things were needed. At Addis they gave the Gipsy Six a so-called 50-hour check, but little work was required on it.

For maps we went to Stanfords, using the million-series for such a long trip. The sheets which showed Benghazi to El Adem were 20 years old, but they were the only thing obtainable. E.E.

ANATOMY OF A MIRAGE IV: FRANCE'S SUPERSONIC BOMBER

This cut-away drawing (provided by the manufacturers) of the Dassault Mirage IV shows the structural similarity between France's supersonic bomber and its predecessor, the Mirage III intercepter. The crew of two sit in tandem; behind them, electronic equipment, and then fuel tanks, straddle the intakes of the two SNECMA Atar 9s. Note the refuelling probe in the nose. The large radome beneath the fuselage can be seen in photographs on page 525



Weat

BISMUTH is th… given t… of Coastal Com… RAF Al… Atlantic in sea… her infor… flights, No 202 … ded by S… meteorological … rly engag… undertaking th… accumul… flights, made m… 500ft but … part in Meteoro… e forecas… involved. A nin… w is carr…

Passing by a trawler on a north-bound course from Aldergrove

Met. observers confer en route

Briefing of crew members by the met. man

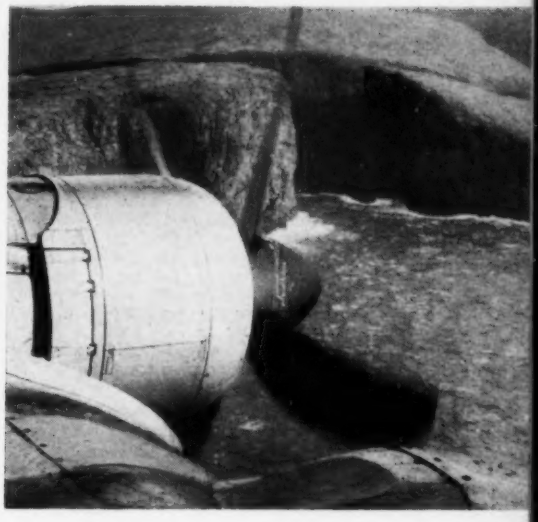
...eather Flight

...UTH is the ...e given to the five flights a week made by Hastings aircraft ...stal Com... RAF Aldergrove in Northern Ireland out into the ...ic in sear...ther information. The squadron which carries out these ... No 202, ...ded by Sqn Ldr M. P. Davies; it is the only long-range RAF ...ological ...rly engaged on this type of work and in the 14 years since ...aking th... accumulated a vast amount of specialized experience. The ... made ma...500ft but in parts at 10,000 or 18,000ft, play an important ... Meteoro...e forecasts: these pictures convey an impression of the work ...d. A nin...w is carried and the flights last about nine hours.

Looking-in on the aircraft's position

...route

Navigational computations



Around the rugged rocks

Dawn at Aldergrove

USAF F-102 Delta Daggers on the flight line at Wheelus Air Base during assignment for weapon training; below, a C-130 Hercules of the 322nd Air Division and a C-124 Globemaster of the Military Air Transport Service on the apron

SHORES OF TRIPOLI

USAF Weapon Training in Libya

BY HUMPHREY WYNN

ONE of the airfields planted by the Italians along the North African coast in their Fascist days was Mellaha, some four miles to the east of Tripoli. Used as a fighter base, it took its name from the Arabic word for the salt-pan on which it was sited. The salt-pan is still there, but the airfield has changed beyond recognition. From being a natural-surface landing-ground fringed by palm-trees it has grown into a vast air base. The palm-trees are still there, but at a respectable distance from an 11,000ft runway; and the airfield used by the Italians, Germans and British during the desert campaigns is now one of the largest United States Air Force bases outside the US. The Americans have come to the shores of Tripoli a second time (the first occasion, celebrated with the halls of Montezuma in the Marine Corps hymn, was in 1804): their air forces based in Europe do weapon training from this Libyan landing-ground, named Wheelus Air Base after Lt Richard Wheelus of Air Transport Command who was killed in an accident in Iran in 1945.

Wheelus is the USAFE (United States Air Forces in Europe) Weapons Center, to which elements of USAF fighter wings based in England and Germany come for bombing, rocketry and gunnery training. It is also "the gateway to the Middle East" for aircraft of the Military Air Transport Service bound from South Carolina or Europe to Saudi Arabia or other points East. The parent unit, the 7272nd Air Base Wing, commanded by Col Stebbins W. Griffith, exists "to provide and supervise a program of weapons proficiency training which will help keep USAFE tactical air forces combat ready." The Century-series aircraft, F-100, F-101 and F-102, participate in this programme; and preparations are being made to include the F-105 Thunderchief following its advent in Europe this year. Under the recently announced USAFE reorganization (*Flight*, last week), both the Wing and the Weapons Center are to come under command of the US Seventeenth Air Force—whose headquarters are at Ramstein, Germany—from July 1.

Facilities provided by the Weapons Center are two air-to-air firing ranges over the Mediterranean, an air-to-ground firing and bombing range (El Uotia) about 75 miles to the west of Wheelus, and F-100s and B-57s for target-towing and mission-monitoring duties. H-21 helicopters are used for range support and crash rescue, H-19s for ASR functions.

A recent visit to Wheelus gave rise to a curious compound of new impressions mingled with reminiscences of 1943. The palm-trees, the heavy ozone warmth of a starlit Mediterranean night, the white city with its wide harbour and the buff-coloured desert treading into the sea, these were perennially the same; but everything else was different from the rough days of the desert war. Now there were acres of concrete; lines of F-100s, F-101s and F-102s; two C-124s of MATS and a C-130 parked near the control tower; and on the west side of the airfield, a town of three-storey

"The salt-pan is still there, but the airfield has changed beyond recognition. . . . The palm-trees are still there, but at a respectful distance from an 11,000ft runway." This runway, to which the F-100s are taxying, now carries more tactical aircraft traffic than any other in USAFE

barrack blocks, clubs, restaurants, theatres, shops, a chapel whose lighted window shining into the darkness depicted the B-24 which came down in the desert seventeen years ago and was only discovered last year. In the Officers' Open Mess, there was a fashion show that evening of dresses which officers' wives could buy in the AFEX store, with a commentary that brought Boston and Los Angeles right there into the warm evening air of Tripoli; round the great horseshoe of a bar, pilots from the USAF fighter wings in Europe—from Wethersfield, Lakenheath or Bentwaters, Bitburg, Spangdahlem or Ramstein—chewed over old acquaintanceships or squadron rivalries, or clustered about a group of wives or resident American women schoolteachers, while Libyan barmen in neat jackets served darkly and swiftly on the other side of the counter. Against one wall, a row of fruit machines was being optimistically but fruitlessly clinked; on another wall were displayed the badges of the squadrons which use the Weapons Center. In another room in the mess, a roulette wheel whirred its way round hopefully under a soft concentration of light.

Morning changes Wheelus from an electric nocturnal glitter to a burning whiteness of daytime and the explosive flash of afterburners as Super Sabres, Voodoos and Delta Daggers get airborne. The El Uotia bombing range, reached in about ten minutes' flying, is roughly in the shape of two spoons lying parallel north to south but with their heads at opposite ends. This separation of target areas means that two aircraft can use the range at the same time. Even so, there is so much traffic that it is in continuous employment and timings have to be strictly observed. In addition to the wings from England and Germany, elements of the 65th Air Division (based in Spain) and of the Royal Danish Air Force use the facilities at Wheelus: the base can accommodate over a hundred aircraft and a thousand personnel at any one time on rotational training. The El Uotia range is used by the Super Sabres for air-to-ground firing and by the Voodoos for bombing. The latter's LABS (low altitude bombing system) manœuvre is started at about 100ft at a speed of over 500kt: reference was made to it in an article on the 81st Tactical Fighter Wing published in *Flight* for April 6.

For air-firing practice over the Mediterranean, two types of target are used at Wheelus. These are the Dart, for tactical fighters, and the Delmar, a high-speed, lightweight target, for intercepters. The former is so called because of its dart-like shape. Measuring 20ft in length and six feet across at its widest point, it is carried beneath the port wing of the towing aircraft and reeled out on 1,500ft of cable. The attacking pilot, under radar guidance, flies an "S" manœuvre for his firing passes. Each F-100 pilot makes four attacks, two at high speed and two at low speed, one of them being carried out in a turn. The Delmar target is a lightweight plastic device, reeled out over the range on a 20,000ft cable. Highly reflective to radar, it is used for F-86 and F-102 training. In the initial phase of F-102 training at Wheelus, their pilots acquire familiarity with the GAR-1D Falcon missile in practice operations.

Each tactical fighter pilot in USAFE comes to Wheelus on the average twice a year to requalify in his weapon system, his stay there lasting about a month at a time. The wings all have their own nucleus at the base, with an allocated flight line area and a block of billets. For the record, it is estimated that in a year the pilots who come for rotational training expend a quarter of a million rounds of ammunition and 75,000 bombs, doing a total of 45,000hr flying.

Wheelus has come a long way since its "gunnery camp" days in the early 1950s, and recently the 7272nd Air Base Wing has improved things still further by a reorganization. Main features of this are the streamlining of all weapons training operations and their support, under a centrally controlled system; inauguration of a new continuous rotational plan, under which the tactical fighter wings send elements of all squadrons to the Weapons Center simultaneously, instead of single squadrons in full strength; provision of new air-to-air target systems (Dart and Delmar, already referred to) and revision of procedures to coincide with them; improvement of facilities for handling tactical fighters and fighter/intercepters (the latter in a separate, newly equipped area); establishment of an intercepter training phase for F-102 Delta Daggers, and initiation of plans for the F-104 Thunderchief programme. A new tri-deputy system of command has been established at Wheelus under the base commander, Col Griffith, and his deputy Col Benjamin S. Lambeth, Jr. In charge of operations is Col Frank K. Everest, Jr, former chief test pilot at Edwards AFB and once known as "the fastest man alive" for his flight at 1,957 m.p.h. in the Bell X-2 in July 1956.

Wheelus Air Base now covers an area of more than 3,000 acres and its runway carries a greater volume of tactical aircraft traffic than any other runway in USAFE. During 1959, for example, aircraft movements at Wheelus totalled 136,477. This monthly average of 11,287 was achieved despite a three-week hiatus in operations while the runway was being resurfaced. These figures are mainly accounted for by tactical aircraft, which make most of the sorties, but they include transport and other types of operation. Wheelus is a MATS (Military Air Transport Service) base, housing the 1615th Support Sqn: it handles 3,000 passengers a month, 10m pounds of cargo and 100,000lb of mail on services by MATS aircraft. Personnel of units engaged on weapons training at Wheelus are flown in there by aircraft of the 322nd Air Division, based at Evreux in France. (On *Flight's* recent visit to Wheelus the outward flight was made by C-124 of MATS, via Ramstein, Germany; the return by C-130 Hercules of the 322nd. With about 65 USAF men aboard, this aircraft made the 1,400-mile flight to Bentwaters in 3hr 40min from take-off to landing.

Palm-trees, mud-walled houses, small arid fields, typify the landscape around Tripoli, to which these Voodoos add their low-level pattern

"Flight" photographs

Each fighter wing using Wheelus has its own insignia board: here pilots of the 81st on detachment pose studiously in front of theirs

The headquarters of the Mediterranean AACS (Air and Airways Communications Sqn) Region is at Wheelus. This organization has an area of responsibilities extending from the Azores in the West to Pakistan in the east; it has six squadrons and seven detachments, and one of the squadrons, the 1950th, is based at Wheelus. Another unit there with far-flung responsibilities is Detachment 2 of the 57th Air Rescue Sqn. This detachment operates RC-54 Rescue Masters and SA-16 Albatross flying boats; its parent unit maintains a rescue alert over an area extending eastwards nearly to Burma and southwards to the tip of Africa. There is also at Wheelus the 329th Engineer Detachment (Geodetic Survey), a US Army Mapping Service unit "conducting a Special Foreign Activity mapping survey for Libya."

With so many permanent and transient personnel, and in an environment where amenities are few and far between, it is not surprising that Wheelus provides practically everything "on base" for its inhabitants. An official description speaks of it as "a modern, extensively equipped installation which, despite its palm-laced North African setting, has all the characteristics of a typical American community. It has two chapels, a school system embracing 12 grades, four major clubs, a complete AFEX shopping center with one branch and various concessionaire services, a library, a modern 150-bed hospital, a dental clinic, a bathing beach, an Olympic-style swimming pool, two theaters, a combined AFRS-TV facility, and a wide range of facilities for sports, entertainment, recreation and social activity. The base has both housing and trailer living areas, but the great majority of personnel with families reside off base in the Tripoli area. . . . Approximately 2,000 USAFE Libyans are employed in various base services."

Libya has since 1951 been an independent kingdom, after centuries of mauling and suzerainty by foreign nations, from the Phœnicians to the Fascists. A Base Rights Agreement was signed between the United States and the United Kingdom of Libya in 1954. There was a review of the terms of this agreement by the two countries in 1960, when an understanding was reached that its present provisions would not be subject to further review for another five years. So until 1965, unless there is some dramatic change in the international scene, the US may go on sharpening its aerial swords in the clear skies above the Libyan desert and littoral. This whetstone, clear of the imponderable European climate, is an asset for the USAF to "keep its tactical air forces combat ready."

"The Klemm stood rather insect-like on the concrete, its bulgy cockpit hunched forward ahead of the wing . . ."

BY MARK LAMBERT

No 142 of the series

"Flight" photographs

BÖLKOW-KLEMM in the Air

GERMAN aircraft are still comparative rarities in this country—so much so that when the demonstration Bölkow-Klemm KL 107C arrived here recently, its German pilot, Mr E. Heinke (who is sales manager of Bölkow) was interviewed for television. He had flown Me109s during the war, and the interviewer made the most of this now friendly arrival at Biggin Hill, famous name in Britain's wartime fighter defence. The name of Klemm is remembered in Britain from pre-war days, but it is now to disappear, because Bölkow have taken over the company. Though the KL 107C is designated Bölkow-Klemm, its four-seat successor, due in Britain very shortly, will bear only the Bölkow title.

I flew the KL 107C at Biggin Hill on a day when even the brightest aircraft were reflecting only grey skies. The Klemm stood rather insect-like on the concrete, its bulgy cockpit hunched forward ahead of the wing and its long tail supported by a smoothly faired tailwheel. Quite a large aircraft, it needs all its 150 h.p. to make efficient headway. But it is pleasant to fly, visibility from the front seats is excellent and full aerobatics with two occupants are permissible. Shoulder harness for both seats is standard equipment. Nowadays one can forgive an aircraft a great deal if it has these basic qualifications. In addition, the Klemm flies sufficiently realistically to have a definite (though viceless) stall.

Lufthansa use KL 107s for basic training of their pilots. In addition to its training and obvious touring roles, the KL 107C can tow gliders or banners, and some examples have been fitted with spray tanks—beneath the wings—and appropriate dispensing equipment. The British agents for the aircraft are Flair-Aviation Sales Co of Tower House, College Road, Bromley, Kent.

Dual controls with sticks and rudder bars, and toe-pedal brakes on the left, are standard, together with a single central throttle lever which moves up and down rather than forward and back. A second throttle on the left wall is an optional extra. Pedal reach is adjustable. Basic instruments—which on the demonstrator included curious twin altimeters, one reading only hundreds of metres, the other only thousands—are to be replaced in aircraft sold here by British-made horizon and turn-and-slip, sensitive altimeter and a.s.i. Other instruments included a recording tachometer, fuel and oil pressure and oil temperature gauges, with a minimum-temperature light for oil, and two little linear fuel gauges mechanically operated from floats in the two fuel tanks in the right rear of the cabin. Almost all levers were grouped on the central console and included carburetter heat control, magneto switch, mixture plunger, throttle lever, fuel hand-pump (operating on No 1 tank only), fuel selector lever, parking catch and cabin heater control. The master switch was a single contact-breaker; the primer was off to the left. A very sound little Becker 24-channel VHF radio with tunable receiver was fitted; we made contact with Biggin tower from inside one of the hangars.

A hand-brake-type flap lever controls 23° and 44° deflection of the split flaps, a small catch behind it locks the tailwheel for take-off, cruise and landing, and a large, smooth trim-wheel sits with its linear indicator between the seats. The narrow-chord ailerons are slotted, and control friction on the ground is negligible. Very large doors on either side open right forward and downwards and clip against the nose. They can be jettisoned by pulling out the hinge pins.

All instruments had appropriate green and red sectors, so very little briefing was required on speeds and engine conditions before we flew. Access is by footstep and handle up onto a narrow walkway over the wing. The doors are very wide, and a good handle makes it easy to swing forward and down into the front seats. Once Heinke and I were strapped in, the windows steamed up pretty quickly, but two small ventilators and the d.v. window on the left kept visibility reasonably under control. The 150 h.p. Lycoming O-320-A engine responded directly the button was pushed and we were ready to move off. There was a moment of frustration when I tried to turn with the tailwheel locked central, but we released it and then progressed very smoothly, using the excellent brakes for steering. The aircraft looks stalky and rather narrow-tracked, but it steers and rolls well on either concrete or very rough grass, even in an annoying cross-wind. Throttle response was absolutely precise. Only the noise level was a little high.

Standard take-off checks covered everything and we lined-up and locked the tailwheel. I made the first take-off clean. The noise suggested a good deal more acceleration than we actually experienced, but the Klemm flew off smoothly by itself and climbed sedately away. One's first impression was that control was very precise, with immediate response in all axes, but the stick-rate soon proved to be high and forces increased rapidly as the stick or rudder were moved farther from centre. The rudder was heavier than the ailerons. A moderate amount of right rudder was needed to cancel torque during the climb.

About 400m (1,300ft) above Biggin I levelled off and kept the fixed-pitch, Hoffmann wooden propeller at 2,400 r.p.m. as the speed built slowly up from about 130km/hr (81 m.p.h.). I had to trim the nose down steadily until speed stabilized at 200km/hr (124 m.p.h.), the advertised cruising speed. Trim control was outstandingly good, the wheel being light to move, well-geared and precise. The nose sat well down at 200 km/hr (124 m.p.h.) and visibility was exceptional. Some force was required to build up a high rate of roll; and, as soon as the pressure was released, the stick sprang precisely back to centre and the angle of bank remained constant. Elevator control was initially a fraction lighter and response was slightly better. As already suggested, the rudder was heavy; but little was required to co-ordinate sharp reversals of turn.

After a few minutes of this I reduced power and let the speed fall slowly off. The change in angle of attack was reasonable and control effectiveness remained, without great reduction in stick forces. The Klemm proved willing to be pitched sharply up at 80km/hr (50 m.p.h.), the stalling speed marked on the a.s.i., and showed no signs of breaking away or running out of elevator. Finally I pulled the stall at about 75km/hr (47 m.p.h.) i.a.s. and it came with a brief, hard shudder and a lurch into a right-hand spiral dive. I centred the stick and we were immediately in business again, but going downhill. This was very unlike a typical American light aircraft, but much more genuine. I prefer an aeroplane which remains fully controllable right to the end, and then breaks firmly, to one which

Instrument panel and controls of the KL 107C. Certain basic instruments will be replaced by British-made equipment on the Klemms sold here

becomes progressively short of control and then peters out into a slow decline downhill. The second variety can catch you out on the round-out if you make a rather slow approach without power.

Lowering flaps on the Klemm called for a little manual effort, but produced only small trim-changes. Once down, the flaps were effective and I was able to fly along, rocking the wings, at about 50km/hr (31 m.p.h.) i.a.s. Power-off, we stalled at about 60km/hr (37 m.p.h.) i.a.s. and again went into a right spiral. In the glide, full aft trim stabilized a speed of just under 100km/hr (62 m.p.h.) with the fuel tanks in the back almost full, but the rear seat empty. There was no v.s.i. with which to measure the rate of descent in this condition, but the angle looked quite adequate for an approach. There was plenty of aileron for sharp manœuvring at this speed and no apparent inclination to stall early in a steep turn. Flying straight and level, the Klemm could be precisely trimmed and did not wander directionally, despite some turbulence. Noise was still pretty insistent, but in other respects I was beginning to feel happier and happier. The heater was keeping us warm, the visibility was exceptional and the seats were comfortable. Had the sun been shining, there were roof blinds for shade.

The time had come to try some aerobatics, but the shelf above the fuel tanks was so well stocked with brief-cases and control locks that we had to do some sorting-out before risking negative g. I made Heinke clutch a big striped control-lock frame and a brief-case, put a small toolbag in the glove compartment and hoped some overcoats would remain in the back seat. Then I made a clearing turn over a gap in the lower cloud and dived to 250km/hr (155 m.p.h.) for a first loop. With a good stout pull on the stick the Klemm sailed over, but the g on my right arm tended to close the vertically moving throttle lever. Over-the-shoulder visibility was fine for seeing the horizon coming up behind as we went over. But 250km/hr was evidently unnecessarily fast and I tried starting another loop at 230km/hr (143 m.p.h.). Again no bother; the aircraft just sailed happily round.

Instead of trying rolls and other miscellaneous manœuvres I then started waltzing around some cumulus cloud, shooting through the valleys, racing round the blind corners and darting up and over the cliffs. This sort of thing can be amusing if the cloud is sufficiently mountainous; and it gives a good idea of the amount of urge and manœuvrability an aircraft offers. The Klemm came out pretty well. Most of the time we were at about 130 to 150km/hr (81 to 93 m.p.h.), using not quite full power; and I was able to roll smartly round the corners and weave through the gaps more or less as I wanted. The aircraft evidently feels less manœuvrable than it really is.

Finally we returned to the circuit for a couple of landings. The only out-of-the-ordinary checks to remember were to apply carburetter heat when closing the throttle, to lock the tailwheel and to select No 1 tank so that hand-pump stand-by was available for fuel feed. I settled on an approach speed of 69 m.p.h. and pulled both degrees of flap. We were rather high and I thought we should overshoot, but Heinke suggested a cautious sideslip, not letting the speed drop below 110km/hr (68 m.p.h.). There was not very much rudder, but it helped; and we glided down to a very comfortable round-out. The float did not last too long, but I had enough elevator to touch down tailwheel first. After that the tailwheel lock kept us straight and brake could be firmly applied. The run was very short.

For a second take-off I tried half flap. As on the first try I held the locked tailwheel down to keep us straight and released pressure progressively as we gained speed. The aircraft again flew off very smoothly by itself, gentle retraction of flap at 120km/hr (75 m.p.h.) causing no noticeable sink. The second landing was much like the first, apparently overshooting, but this time I had to use a trickle of power rather than side-slipping. Again the tailwheel touched distinctly before the mainwheels, but there was no tendency to bounce.

I think the Klemm is an honest aeroplane, a more solid flying machine than the average touring dreamboat. It has excellent visibility, is stressed for aerobatics, and the basic model costs " about £4,300 " in UK. Delivery is offered virtually immediately. I am glad that the English buyer can now choose between the A to B tourer and the pilot's aeroplane.

BÖLKOW-KLEMM KL 107C
(One Lycoming 0-320-A2A giving 150 h.p.)

Span, 35ft 6in; length, 27ft 4in; wing area, 157 sq ft; empty weight, 1,378lb; useful load, 761lb; gross weight, normal operation, 2,139lb; gross weight, aerobatic, 1,918lb. **Performance, at 2,139lb:** maximum speed, 146 m.p.h.; maximum cruising speed, 128 m.p.h.; economical cruising speed, 115 m.p.h.; landing speed, 53 m.p.h.; sea-level climb, 785 ft/min; service ceiling, 13,615ft; take-off run, 951ft; landing run, 771ft; range, 522 miles at 5.7 Imp gal/hr or 423 miles at 8.2 Imp gal/hr.

AERO COMMANDER 560F in the Air

No. 143 of the Series

PEOPLE often raise their hands in horror at the mention of the Aero Commander because, they say, it is extremely expensive. But they fail to realize that this well-known American type is not just another light twin; it is a fully equipped transport with exceptional cruising speed and range, and a capacity for up to seven occupants. And yet it is also, in my opinion, the best pilot's aeroplane of all the series—a delight to fly. Woods of Colchester already have a Commander 500B based at Boxted, near Ipswich, and use it hard for journeys all over Europe and Africa. Now, Field Aircraft Services, the British agents, have their 560F demonstrator fully operational and will soon obtain the public transport category C of A.

I flew an early Commander 520 in 1954 and another 520 a few months ago and fell for the type in a big way; and last week I spent a couple of hours in Fields new 560F demonstrator flying between Biggin Hill and Stapleford Tawney with Ken Burvill of Fields. The 560F is much more potent, but still has the classic handling qualities of the earlier models and we had great fun landing and taking off from Stapleford and watching Ken formating on the photographic Aircoupe (courtesy of Air Rent Ltd) at speeds around 100 m.p.h. (see heading picture).

The 560F is the second-most potent of the Commanders and has geared, direct injection Lycoming IGO-540 engines giving 350 h.p. each, but all Commanders have virtually identical airframes. Fuel tankage varies and gross weights rise from 6,000lb for the 500A to 8,000lb for the 680F. All versions have exceptional speed and range performance and now also have the new flat nacelles which provide lift more than equivalent to the weight of the engines. The undercarriage legs also rotate to lay the main wheels flat in the nacelles on all models.

The cabin is largely forward of the wing, reached through a door to port by ducking under the trailing edge, clear of the propeller. Inside, there is plenty of room and the seats run on tracks so that they can be shifted considerably to make various arrangements. The usual optional couches, desks and cocktail cabinets may be had, but the standard seating supplied with the basic aircraft is four. A big separate baggage compartment occupies the full width of the fuselage aft of the cabin. The new nacelles allow a better view from the large side windows, but the propellers are just behind the pilots' backs. From the front seats, the visibility is about as good as it can be, the nose being barely visible and the sills of the side windows being at about waist level.

Control layout is excellent, as it always has been in Commanders. All switches used when starting are lined up on an overhead panel; and the trim wheels and various shut-offs and secondary controls are farther back in the ceiling. Instruments are grouped on the grey, shock-mounted panel and there is ample space for anything one cares to fit. The control columns and wheels are side-mounted, swept over to the middle and the sitting position is such that the panel is ahead of the knees. The central pedestal carries engine

The pilots' end of the Aero Commander 560F. Note ample panel space and neat layout. Fuel, starting and trim controls are above the windscreen

AERO COMMANDER 560F in the Air

levers and flap selecter and, in the demonstrator, an ARC radio compass. Engine instruments including paired cylinder-head temperature, r.p.m., intake pressure and fuel-flow gauges are in the middle. Everything is visible and accessible without difficulty.

The Commander 560F is lavishly equipped. It has electrically operated fuel cocks, powered hydraulic brakes and nosewheel steering, cooling gills, duplicated hydraulic pumps, generators and suction pumps, plus a stand-by electric hydraulic pump, stand-by air pressure system for lowering the undercarriage, Goodrich lightweight de-icing boots, discharger wicks, combustion heater for the cabin and windscreen defrosting, heating for pitot head and fuel vent and oxygen system. There are plenty of microswitches and systems to know about. The structure is obviously robust and feels infinitely more solid, if you knock around with a knuckle, than most of the American light all-metal types. The Commander in fact deserves a properly qualified pilot but is certainly not beyond a sound club pilot's ability for routine flying. This particular aircraft, G-ARDK, carried Bendix 21-series VHF com and com-nav, ILS glide-slope and marker beacon and an ARC radio compass, but there is room for twice this equipment, plus autopilot (Sperry SP.3) and weather radar.

The Lycoming IGO-540-B1A engines have three-blade Hartzell propellers and the mixture levers regulate fuel flow, indicated in lb/hr—a very useful cruise-control adjunct. With boost pump on and mixture rich, the engines are electrically primed and the lever is then pulled back to idle cut-off for starting. The main 130 Imp gal centre tank is first used to feed both engines and there then remain two wing-tanks, each holding 28 Imp gal. No cross-feed is needed.

With a low power setting, the aircraft rolled nicely away from the Biggin apron and I tried steering. The first 120lb of hydraulic pressure released to the system by toe-pedal movement goes to the nosewheel steering jack so that, when I pressed a pedal very gently, the aircraft first turned and then braked itself into a sharper turn. It was easier to steer with the pedals held by the control locks, but it only took a little learning.

I had the impression of sitting almost on the ground, right in the nose of the aircraft, and visibility was perfect. At the end of the runway, Ken checked propellers and magnetos and we went through a lengthy, but straightforward list of checks, including opening the gills half-way (8sec depression of the control switches) and removing the control lock frame from the left wheel and pedals. The weather was very misty, but we hoped to make Fairoaks to pick up our Gemini for some air-to-air photography. Having lined up, I applied high power progressively and we were soon being torn along the runway with a snarling din of engine and propellers. At about 80kt I started pulling back quite hard and the Commander unstuck with a pronounced rotation off the main wheels to climb away at almost 2,000ft/min.

The gear fairly whistled into its recesses with hardly any trim change and Ken throttled back and closed the gills. The latter cause a distinct hard buffet when open so that one is not likely to forget them. We then turned south to do some flying near the south coast, but we soon found ourselves stooging along, mostly in cloud at 1,500ft, navigating by Mayfield NDB and Lydd VOR. The more we went south, the worse it looked and we abandoned all hope of Fairoaks and headed north for Essex, where they said it was fine. Leaving the control area we climbed out of the top of haze near Rochester and then found perfect weather over Essex.

While stooging in the murk I had already reacquainted myself with the Commander's silky handling and a stability which allowed me lots of time to tune radios and fiddle with maps while flying blind. Then we settled at 4,000ft with 25in and 2,600 r.p.m., which was about 75 per cent power and gave us 130lb/hr fuel flow per engine and a smooth 180kt i.a.s. This was really moving, but the Commander was as steady as a rock. Maximum full manœuvre speed is only 135kt, so I tried no rates of roll, but lateral stability proved exactly neutral and co-ordinated turns were possible with either rudder or aileron alone. The elevator appeared to be fractionally less smooth, but this was a new aircraft with a little control friction. I moved the trim wheels and found them extremely powerful and fairly high-geared, but easy to set accurately.

Reducing power caused only a slow nose drop, but full reduction brought a jerk of drag as the propellers went into fully fine pitch—something like applying airbrakes. I had to retrim to be comfortable, but I did not have to clutch at the trimmers as one does on some American types. Gear can be extended at 140kt and it comes down quickly, with distinct thumps of locking down, and very little trim change. The first 10° of flap bring the nose up, but the remaining 30° make little difference. At about 90kt, flying level, I had remarkably good aileron control as well as hands-off stability and could really throw the aircraft around.

With some power I then brought the speed back progressively. The angle of attack increased markedly and we began to lose height. At 70kt the stall warner complained (how I hate those devices!): at 67kt the whole aircraft shook hard and at 65kt it fell away firmly on one wing and started fast downhill. It was a full stall but not a rough one. I recovered from the dive without forward stick and without power. Good aileron control had remained until the last moment. The stall was grown-up but the manuals give maximum height loss with correct recovery as 300ft.

I then set up a full flap, gear down, power-off glide at 85kt, which seemed a good approach speed, and the v.s.i. said 1,500ft/min rate of descent—more than enough for anyone. When I pulled the control column sharply back, the nose pitched right up, but the rate of sink increased, so there was lots of elevator, but not much spare lift under these conditions. Power-on, of course, the approach was more measured, the propellers giving much less drag and encouraging lift.

AERO COMMANDER 560F

(Two Lycoming IGO-540-BIA giving 350 h.p. each)

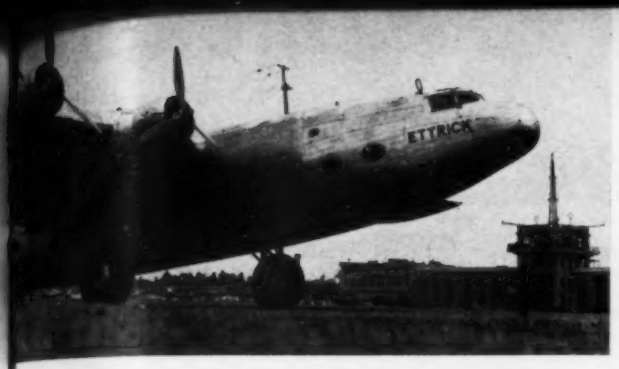
Span, 49ft 6in; length, 35ft 1½in; empty weight, 4,650lb; useful load, 2,800lb; gross weight, 7,500lb; fuel capacity, 186 Imp gal.

Performance: cruising speed at 70 per cent power at 10,000ft, 232 m.p.h.; stalling speed, gear and flaps down, 73 m.p.h.; service ceiling, 2 eng, 21,900ft; service ceiling, 1 eng, 9,800ft; initial climb, 2 eng, 1,587ft/min; initial climb, 1 eng, 490ft/min; take-off to 50ft, short field, 1,350ft; landing distance from 50ft, short field, 1,375ft; range at 55 per cent power, 30min reserve, 1,705 miles.

Next I tried one engine-out manœuvre, setting full power on both engines at 2,500ft and 100kt, with 10° flap and gear down. Minimum control speed is given as a mere 78kt so we had plenty in hand. At a word from me, Ken throttled the right engine fairly rapidly to 10in boost, equivalent to a failure. The Commander lurched to the right, but I was able to hold it easily, increase speed by 5kt, get the gear and flap up and settle into a 500ft/min climb without losing height. I then found that a couple of turns of rudder and just a touch of elevator trim took out all loads. The ailerons were powerful as ever and I was again able to throw the aircraft around vigorously.

We then approached Stapleford, at 100kt downwind and 90kt on base leg, keeping the propellers off that high-drag, fine-pitch setting as we came on down towards the 700yd grass strip. Everything was plain sailing and the Commander stayed glued to its trimmed speed. We seemed to rocket in over the hedge at 85kt, cutting power and pulling a long way back to touch down with the nose high in the air. Ken immediately braked hard and we stopped dead in about 400yd. I made several more landings and take-offs from Stapleford, and watched other people make them. It looked and felt fast, but every time the distance was about 400yd and the ride was remarkably smooth. The brakes were extremely powerful and the steering good. The book says you can approach at 77kt, with 15in power and full flap and stop in about 1,300ft.

Take-offs were similarly impressive, with an initial rate of climb at 100kt which crowded 2,000ft/min each time. During subsequent flights we cruised at 22.5in and 2,600 r.p.m. and had 165kt i.a.s. and 103lb/hr fuel flow per engine. That aeroplane really moves in every sense of the word. Perhaps my only criticisms are that the noise level is slightly intense—by American, not British standards—at the higher powers and that the throttles are a little inexact in controlling the engines. I am sure that a professional pilot would love this aircraft and it would certainly make a magnificent travelling vehicle.



A name meant to be read (see letter from Mr Peter W. Moss)

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Landing Fees—Plus

THE article "Landing Fees—Plus" in your March 16 issue is a scholarly and useful study. To the airline eye, Mr Marchault has perhaps been adding apples and lemons; but he has cast a great deal of factual light on the many other kinds of charges besides landing fees which bedevil the airlines, and whose proliferation is an increasing threat to the economic base of air transport.

Without reflecting on these considerable merits, I might suggest that the "plusses" are hardly germane to the main issue between the airlines and their landlord at UK airports. There is, in fact, little or no direct connection between landing charges and fuel taxes, since the latter in many cases are levied to enrich the public treasury rather than to provide revenue for the airport authority.

If one must combine fuel taxes with landing charges, practical operating conditions would produce a much different graph than the one you have published. The computations of fuel taxes at Manila, Reykjavik and Ciudad Trujillo are based on the maximum amount of fuel which a big jet could suck up with empty tanks. In practice, stage lengths, the necessity to carry some payload and the very exorbitance of the taxes themselves reduce the fuel intake to much smaller proportions. Actual, rather than hypothetical, data would therefore pull down the bars which represent these airports on your chart; and it is a pity that apparently none of the carriers affected was consulted before it was drawn.

None of the airports which you have listed as being more expensive than London on this questionable basis come anywhere near matching the importance of London as centres for scheduled air traffic. Nor do their total charges have so serious an impact on the rate structure of so many airlines. At Khartoum, the jet charge may be higher than at London, but charges for other aircraft, which represent the bulk of the movements there, are a good deal lower. And Hong Kong, it must be noted, is under UK jurisdiction. Whichever way one chooses to figure it, UK airports—and London first among them—maintain their unhappy pre-eminence.

IATA members entirely agree that air transport operators should pay their fair share of airport costs. But they also maintain as a matter of simple justice that they should not pay others' shares as well; and that they should pay only in respect of those airports they actually use. They submit that the Ministry is charging them not just for those airports, but also for a gaggle of purely domestic aerodromes for which they have no requirement; and even with landing fees at their present levels, they suggest that in a very short time the three airports used by the international carriers will be subsidizing the other less profitable ones in which they have little, if any, interest.

Montreal S. RALPH COHEN,
Public Relations Officer, International Air Transport Association

Airliner Fleet Names

WRITING as an aviation historian and representative of an association closely concerned with recording the history of British civil aviation, I feel moved to make an appeal to the major UK airline companies, through the medium of *Flight*, for some rationalization in bestowing fleet names on airliners.

Before the war, Imperial Airways continued the policy of its predecessors by allotting names to new types on order. In 1930 a system of "class" names was devised, whereby a letter of the alphabet was used to formalize names beginning with that letter, e.g., *Frobisher* of the F-class D.H.91 Albatross. This policy was continued by BOAC when Imperial Airways and British Airways were amalgamated in 1940. When Boeing Stratocruisers were delivered in 1948, BOAC revived certain of the more famous names associated with Short C-class Empire flying-boats of 1936-47. No doubt BOAC wished to pass on the glory won by those immortal flying-boats with their reputation for reliability in public esteem. However, with the advent of Comets and Britannias this policy of fleet names was suddenly dropped by BOAC. Why?

BEAC (to give them their correct initials) also indulged in giving names to Vikings, DC-3s, Viscounts and Vanguards. But with their new colour scheme it was decided that names spoilt the décor, whereupon they were banished to the aircraft's interior! This sort of policy makes me wonder if the fleet name has become a purely decorative device which the modern airline company regards as superfluous. If so, they are quite wrong in the assumption.

Until recently, fleet names have played an important part in the history of commercial aviation, and for many people connected with the industry the airliners of a past era are remembered with a mixture of awe, invective, nostalgia and respect. But the important point is, the airliners are referred to by their *fleet name* and not by registration letters. How many members of the lay public who visit London Airport, for instance, can with confidence identify a particular airliner from the numerous examples of its type? Very few, I would say, for when an airliner does sport a name it is too small to be read easily from the "roof gardens." I feel sure the public would take more interest in airport movements if airliners had short names in letters large enough to read easily. As a guide to the ideal size of lettering I enclose a photograph [reproduced here.—Ed] of *Ettrick* of the Ensign class, taken at Croydon in 1938.

It would appear that airline companies of today would rather sacrifice more time and money (and weight) to giving their aircraft elaborate colour schemes which loudly proclaim ownership and minimize almost to extinction any marking of individuality.

Ruislip, Middx PETER W. MOSS,
Hon. General Secretary, Air Britain

Swing Tails

THERE is no mystery about the first aircraft to have a swing tail: the pictorial evidence has been available since the 1919 volume of *Jane's All the World's Aircraft* was published. If the editor of *Canadair Service News* ["Swing-tailpiece," *Flight*, February 17] cares to look at page 156a of that book he will see an illustration of the sixth prototype Parnall Panther, N.96, with its fuselage folded to starboard. The "Mr Harold Balos of Bristol" to whom the US

The swing-tail Parnall Panther, designed in 1917

patent was granted was, of course, the late Harold Bolas, the ingenious designer of the Panther. The aircraft was designed in 1917; six prototypes and 150 production machines were built; and the type saw service with the RAF in the years immediately following the war. I enclose two photographs [one of which is reproduced above.—Ed] showing N.96 with its fuselage folded.

Birmingham 32 J. M. BRUCE

[Since Mr Bruce's letter was received, Mr C. P. Truyens of Blackburn Aircraft has written to similar effect; he adds that the design was intended to facilitate shipboard stowage and that the Panther was described as a "two-seater ship aeroplane for reconnaissance work with the Fleet."—Ed.]

FORTHCOMING EVENTS

Apr	20	RAeS Astronautics and Guided Flight Section: Symposium on Air Traffic Control.
Apr	25	RAeS: "On the Origin, Structure and Growth of Vortex Separations," by E. C. Maskell.
Apr	26	Royal Air Force Anniversary Concert, Royal Festival Hall, London.
Apr	28	Society of Weight Engineers (London Branch): Forum on "Design, Manufacture and Operation of Aircraft."
May	4	RAeS: Annual General Meeting.
May	5	RAeS Rotorcraft Section: "Transport Rotorcraft Design Trend," by Raoul Hafner.
May	8	RAeS Historical Group: Discussion Evening.
May	9	RAeS: "Structural Weight Estimations for Novel Configurations," by M. E. Burt.

RAeS Branch Fixtures (to Apr 27): Apr 21, *Hatfield*, Annual Dinner. Apr 26, *Hatfield*, Halford Memorial Lecture, "The Era of the Ducted Fan," by Dr S. G. Hooker.

FLIGHT SYSTEM SURVEY

Automatic Landing in France

SUD AVIATION are investigating automatic landing techniques with a view to fitting Caravelles with suitable equipment. A system proposed by Lear, considerably more simple than those now under development in Britain, is to be installed for trials in the second prototype Caravelle at Toulouse. All types of ground-based guidance equipment are under investigation, including improved ILS of both French and foreign manufacture, the French ASV.23 microwave system, Elliott Leader Beacon, Murphy Leader Cable and the Bell radar system, though the last-named is not considered suitable for civil applications.

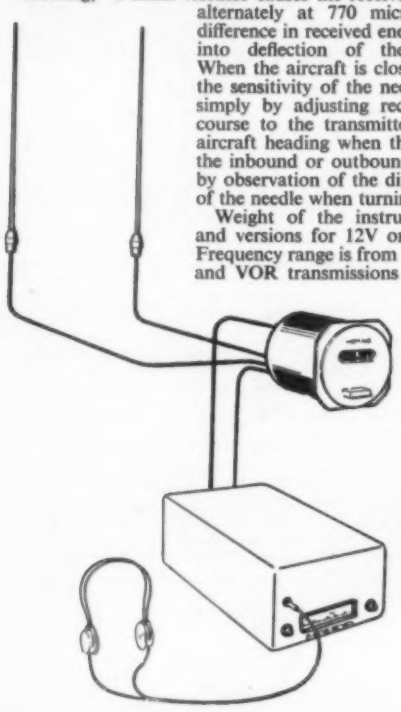
Sud appear to feel that the high degree of protection against failure which characterizes the two British systems, and their resultant complexity, may not be necessary in achieving adequate automation. Any prospect of simplification must be based on the assumption that the pilot can remain in the control loop even during the final critical phase of the landing; and Sud apparently consider that this is possible and that the performance of the human pilot can be effectively predicted—partly in view of the fact that the landing manœuvre is less critical in aircraft of the size and approach speed of the Caravelle than it might be in the larger airliners. They feel that the pilot will be most unwilling to be excluded from the control loop, and will in any case become fully accustomed to the equipment before actually attempting blind landings. It is thought possible to ensure that a failure during the critical time would affect only one axis of a single-channel system rather than the whole system, and that the pilot would have no difficulty in taking over control of this channel.

Though a simplified solution is obviously highly attractive, it remains to be seen whether a sufficient guarantee of safety can be achieved. British investigations, carried out independently by Smiths and Elliotts, have tended to suggest that it could not.

VHF Homing for Light Aircraft

THROUGH their distributors, Radiostal (at Aérodrome St Martin, Bernay, Eure, France) the French company Cotelec is marketing a simple attachment for airborne VHF radios to allow homing to a ground station which is continuously transmitting. The equipment consists simply of an electronic unit built into an instrument case and bearing a small left/right needle on the instrument face. This unit is connected to the existing VHF radio and to two vertical whip aerials mounted one on each side of the aircraft centre-line, about 16in apart. When the selector switch on the instrument is set to "Homing," a small vibrator causes the receiver to use the aerials alternately at 770 microsec intervals, the difference in received energy being translated into deflection of the left/right needle. When the aircraft is close to the transmitter the sensitivity of the needle can be reduced simply by adjusting receiver volume. The course to the transmitter is shown by the aircraft heading when the needle is centred, the inbound or outbound sense being noted by observation of the direction of deflection of the needle when turning off course.

Weight of the instrument unit is 1.3lb and versions for 12V or 27V are available. Frequency range is from 108Mc/s to 132Mc/s and VOR transmissions can presumably be used for homing. On communications frequencies the pilot asks the ground station to transmit continuously for a period. Either telephony or morse can be received and the range of the homing device is stated to be the same as that of the VHF radio to which it is attached.



Left, components of the Cotelec homing attachment for airborne VHF radios in light aircraft. The left/right meter and two aerials are coupled to an existing VHF radio (see news-item in column one above)

Smiths Prepare for FAA Trials

THE Douglas DC-7 which is to be used by the Federal Aviation Agency for trials of the Smiths automatic landing system is at present fitted with a Sperry autopilot; and special analysis and analogue computer-studies were necessary before the Smiths equipment could be matched with it. This work having been completed, Smiths automatic throttle controls are being dispatched to Sperry, New York, where they will be fitted to the aircraft. The aircraft will then be flown to Britain and fitted under Smiths direction with special couplers designed to match the Sperry autopilot with the British system. Also to be fitted are the Standard Telephones and Cables radio altimeter and Murphy Leader Cable receiver; and the work will be begun next October.

Flight trials will be carried out at the Blind Landing Experimental Unit at RAE Bedford and the aircraft should return to Atlantic City for the FAA evaluation "some time in March 1962." Reports from the USA state that the programme is considerably behind schedule. An engineering representative from Smiths at Cheltenham will remain with the aircraft during the trials in America.

ADF Improvements

MARCONI announce two new components designed to improve the efficiency, reliability and life of the well-known AD.7092 series of radio compasses, 3,500 of which are still in use. One is a transistorized switching unit to replace the vibrator and the other is a static a.c. power unit to replace the existing rotary transformer. Either component can be fitted separately and only minor modifications are required. The switching unit replaces the mechanical unit serving the balanced modulator in the loop aerial circuit and loop drive motor. It will be available in June and will cost £55. The power unit, also available in June, will cost £65 and save 0.5lb in weight over the old unit.

Frequency Measurements for the RAF

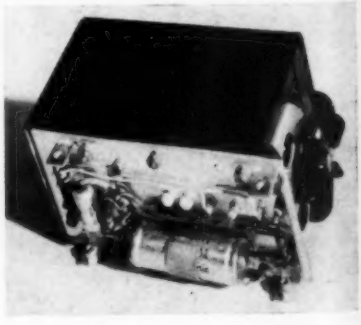
FREQUENCIES of both ground and airborne RAF transmitters are checked to accuracies of between 0.003 per cent and 0.02 per cent, according to internationally agreed tolerances, by the RAF Frequency Measuring and Monitoring Station at Stoke Hammond, Bucks. All RAF transmitters, including those at Nairobi, Gibraltar, Cyprus, Ottawa, Gan, Aden and Malta, are constantly checked and their accuracy recorded, as is interference with or from other transmitters.

For these purposes two Racal RA.17 receivers are used at the station in conjunction with two Racal RA.37LF converters and an RA.63 SSB adaptor. An SA.21B digital frequency meter is used with radio equipment for direct reading of measured frequencies, and accuracies of one part in 10^8 can be obtained. The RAF station is manned by civilians.

A MIG from Ketay

THE Norden division of United Aircraft Corporation have recently introduced a new miniature integrating gyro, type RI-203, and this is now available in the UK through Ketay Ltd, Eddes House, Eastern Avenue West, Romford, Essex. Applications include inertial navigation and guidance for missiles and aircraft. The gyro is used, in conjunction with Norden single-axis accelerometers, in the new miniature all-attitude inertial platform recently shown in the UK.

The gyro is 3.1in long by 2in in diameter and weighs 1lb including heater and shields. Features include a random drift of less than 0.02 /hr and day-to-day stability of 0.1°/hr without trimming. Life of the gyro is 3,000hr, to which the low spin rate of 12,000 r.p.m has contributed.



Right, static power unit which replaces the existing rotary transformer in Marconi AD.7092 series ADFs (see "ADF Improvements"). It will be available in June

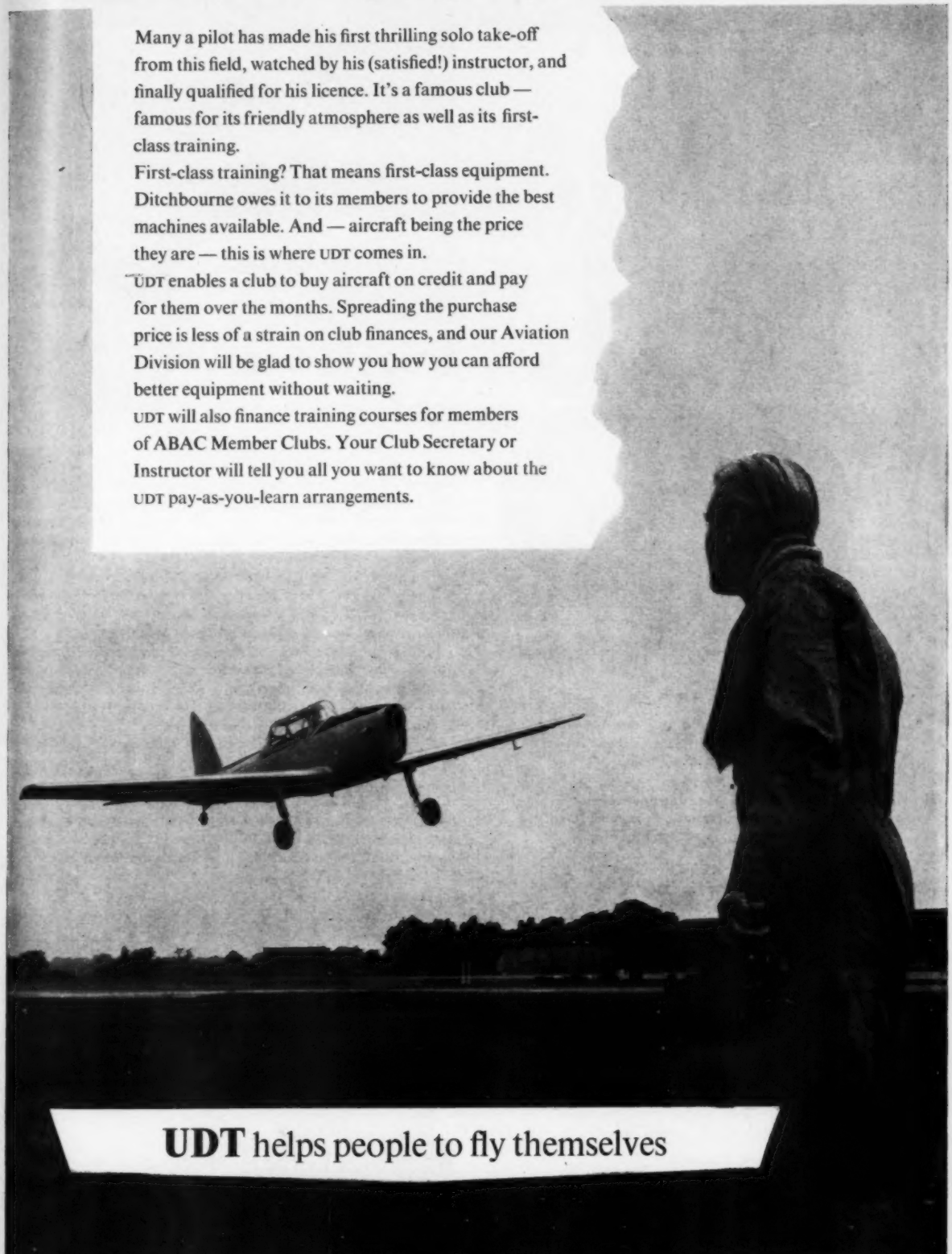
Ditchbourne Flying Club buys a trainer

Many a pilot has made his first thrilling solo take-off from this field, watched by his (satisfied!) instructor, and finally qualified for his licence. It's a famous club — famous for its friendly atmosphere as well as its first-class training.

First-class training? That means first-class equipment. Ditchbourne owes it to its members to provide the best machines available. And — aircraft being the price they are — this is where UDT comes in.

UDT enables a club to buy aircraft on credit and pay for them over the months. Spreading the purchase price is less of a strain on club finances, and our Aviation Division will be glad to show you how you can afford better equipment without waiting.

UDT will also finance training courses for members of ABAC Member Clubs. Your Club Secretary or Instructor will tell you all you want to know about the UDT pay-as-you-learn arrangements.



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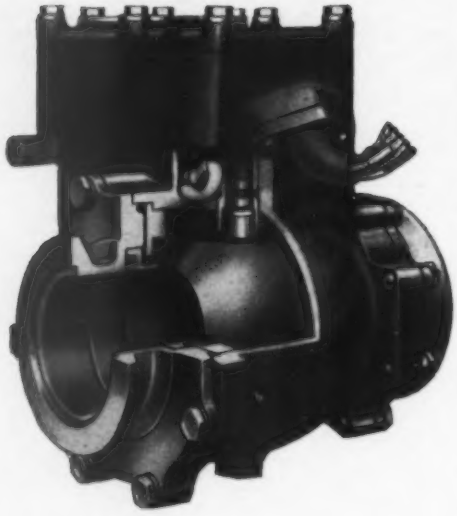


OPEN The full, smooth, parallel bore of the Saunders Spherical Plug Valve permits flow efficiency equivalent to that of the pipeline to which it is fitted.

OPERATION Torque is low at temperature extremes due to spring loading of annular diaphragm seals.

SHUT Spherical seat sealing is augmented by flexible diaphragms ensuring that the higher the pressure the tighter the seal becomes.

SAUNDERS VALVES

The Motorised Mark 4 model illustrated packs its efficiency in one compact unit with the electrical gear achieving lightness by eliminating surplus metal.

SAUNDERS VALVE COMPANY LIMITED
Aircraft Division
BLACKFRIARS STREET, HEREFORD Telephone 3125

Stream-Line filters for trouble-free fuel

The use of Stream-Line filters in the refuelling of aircraft ensures the removal of water and solid impurities from the fuel enabling complete fulfilment of official specifications.

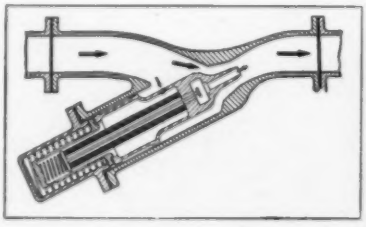
Top right is type K, a highly efficient filter consisting of a number of specially prepared paper discs compressed by springs and mounted on metal rods.

Fuel passes through the minute interstices between the discs leaving solid impurities at the edges. Any water present causes the paper to swell, with a consequent increase of back pressure, which gives an indication that servicing is needed.

Bottom left is the Fuel Monitor, designed in conjunction with the Shell Petroleum Company Ltd. This is a fully "fail-safe" device, consisting of a valve and a water sensitive element, continuously sampling the flow of fuel and causing the main valve to close if water contaminated fuel is revealed.

Bottom right is the high-output MC filter, giving what is for many purposes an acceptable filtration efficiency at a much higher rate than the K type.

NEW THREE STAGE FILTER. Stream-Line Filters Ltd., have recently developed a three-stage filter/water separator which uses pleated elements made from paper, fibreglass and nylon to remove from aviation fuels all solid impurities and all water, in whatever proportions they may arise.



STREAM-LINE FILTERS for aircraft refuelling

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Straight and Level

RUSSIA'S achievement may be the greatest in the history of man, and there are greater ones to be recorded—perhaps before we are five years older.

But I couldn't help feeling mildly embarrassed by the oscular exchange of greetings, Continental-style, between Mr Krushchev, the Soviet Prime Minister, and the gallant Major Gagarin. I felt as I feel when Tottenham Hotspurs dance and smother one another in kisses after scoring a goal.

Here is a more seemly exchange, for use when the first British spaceman, perhaps Mr Peter Thorneycroft's great-great-grandson, lands with a bump near Radlett gravel pits:—

Prime Minister: A good show, Thorneycroft, a good show. Have a cup of tea and take a day off.

Thorneycroft: Thank you, sir. It was nothing really. Just another job, you know.

Prime Minister: Did you keep the Earth under active review, and can we have a full and frank exchange of views?

Thorneycroft: Yes, indeed, sir.

Prime Minister: Splendid, splendid. I will tell the Science Minister at once. I am sure he will be interested.

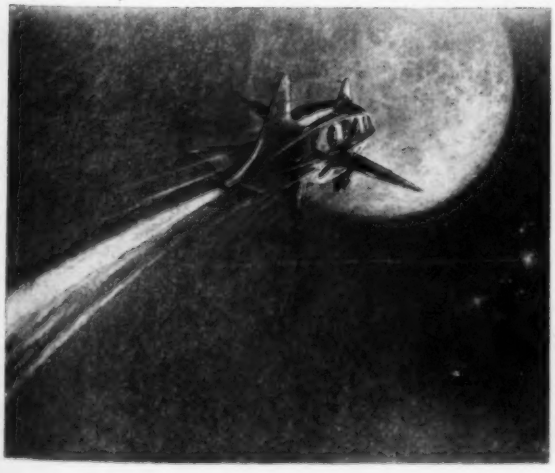
● BEA and BOAC seem to be treading on each other's toes rather. BEA is gateway-crashing BOAC in the Middle East a bit, and now BOAC is applying to operate inclusive tours to Zurich. I wonder whether BOAC have heard of BEA's latest coup—as reported by the *Daily Telegraph* in its News From All Quarters on April 6:—

"*BEA Service to New York—British European Airways opened its Comet services between London and New York . . .*"

● Since a recent move of offices *Flight* has *The Autocar* as a next-door neighbour. Everyone feels at home, for not only does our sister journal have an editor with 3,500 flying hours in his log-book, but the Midlands editor has just bought Hawker's Whitney Straight and two other members of the staff are pilots also. The technical editor helped in developing the Napier Sabre, and one of the assistant editors had quite a bit to do with the undercarriages for the Britannia and Lightning.

In 1903 *The Autocar* owned a balloon; and now I find that our neighbours entered the space business well ahead of *Flight*—as long ago as February 1941, when they published this Gordon Crosby drawing with the comment "The possibility of the whole idea lies in the use of the rocket principle as a method of propulsion . . ."

This 20-year-old notion puts Supercar strictly in the dodgem class.



Now for a man on the moon (see last item, column one)

Flipping through the pages of a new book recording 75 years of Piaggio I did a double-take at this strictly-for-the-fishes-type picture. It shows the remarkable P.7 of 1929, an exercise in hydrodynamics as well as aerodynamics. It took part in the Schneider Trophy race. There were two propellers, one of them—strictly marine—at the back. It must have been fun to fly and, like Piaggio's P.166 today, to whizz about on the water

● According to Dr W. Fliess, a German physiologist and psychologist, everybody—including pilots—goes through three different, but overlapping, cycles. First there is a 23-day cycle of physical strength, resistance and endurance. Then there is a 28-day cycle of nerves, moodiness and creative ability. Finally there is a 33-day cycle of intelligence, memory and mental alertness.

Each of these cycles has its high and low points depending on the person's date of birth. When all three low points happen to coincide, as they do occasionally, a pilot for example has an accident-prone day.

A New York computer firm says it has analysed 15 accidents involving US Navy pilots. It was found that 10 happened on pilots' off-days. According to the *Sunday Express* the firm is soon to receive from the US Federal Aviation Agency a list of civil pilots' names and birth dates so that their off-days can be predicted. Meanwhile a Swiss firm is manufacturing pocket "Fliess devices" costing £12-£16 to enable people to predict the days when things will go hopelessly wrong.

Perhaps Dr Fliess was having one of his off-days when he invented his theory.

Did They Say Spaciousness?

According to a Reuter report from New York, two Convair engineers suggest that millions could "hop across the Atlantic in supersonic airliners in just under two hours" if passengers—and here's quite an if—passengers would accept motor-car seating arrangements "instead of the spaciousness of present-day aircraft . . ."

ROGER BACON

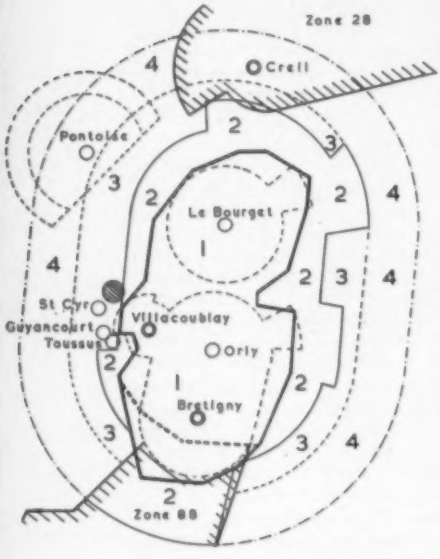
SPORT AND BUSINESS

Airspace Partnership Experiment

ON Easter Monday, April 3, began the greatest experiment ever conducted into equable sharing of controlled airspace between private and commercial aviation. From that date (as forecast in *Flight* for February 24) a new air traffic plan came into force in the Paris area, and will remain effective for six months. It allows light aircraft to penetrate deep into the Paris area while remaining separated from air transport operations.

In view of the advance notice which the experiment received, and the intensive lobbying by French private pilots which led to its introduction, the official announcement was tardy—almost as tardy as is official notification that London Heathrow is available to single-engined and executive aircraft, a Notam about which is still awaited.

The Paris plan became law on February 1, but it was not "gazetted" in the *Journal Officiel* until March 11 and not received by the MoA Aeronautical Information Service at Pinner until March 24. The French Notam arrived three days later, so that only seven days were available for interpretation and repromulgation before the new rules came into effect. It is not known what were the reasons for this delay—ICAO recommends three weeks' notice of such major changes — but they certainly necessitated some fast work by the MoA, who issued 1,000 copies to AIS units in the field for use by individual crews and companies only 36hr after official notification had been received.



Reserved airspace in the Paris terminal area. Numbers refer to the zones which have graduated height limits: these are set out in the table below. The inner "common reserved zone" is delineated by a continuous heavy line: within it are the Le Bourget, Orly, Bretigny and Villacoublay airfield control zones, with climb-out paths to the north-east. Similar terminal-zone arrangements are being considered for Algiers, Bourdeaux and Marseilles

Zone	For transport aircraft	For tourist aircraft
Outer (4)	900 metres QNH to FL 65	ground level to 900m QNH
Middle (3)	750 " " " " "	" " " 750m QNH
Inner (2)	400 " " " " "	" " " 400m QNH
Common Aerodrome (1)	Extends from ground level to FL 30 and is available only to aircraft bound from or to Orly, Le Bourget, Villacoublay or Bretigny, equipped with air/ground radio and under ATC clearance from Paris ACC or one of these towers	

Broadly, the shape of controlled or defined airspace around Paris is now very much as described in our issue of February 24, but the illustration on this page is more up to date and is derived from official sources.

In forming the new airspace pattern, the old 6km-radius aerodrome control zones around Orly and Le Bourget have been abolished, as they had become too small for jet traffic. They are replaced with a much larger irregularly shaped zone common to both airports. Around this has been created a "reserved terminal area" comprising (in plan) three contours, and the area is also subdivided vertically. The outer contour consists of circles of 40km radius centred on Le Bourget and Orly and joined by tangents. The intermediate contour is based on 30km circles similarly linked, whilst the inner consists of linked segments of various radii. These areas are available as shown in the table.

A very French touch is that on Saturdays, Sundays and public holidays the zone is re-aligned in favour of off-airways flying. Then the southern boundary of the aerodrome zone contracts to the position of the heavy dotted line just below Brétigny; the inner, intermediate and outer contours are continued to join up, and zones 3 and 4 continue around to the south instead of being interrupted by the test-flying centre danger area (88) of Brétigny. Zone 28 at Creil is a jet procedural airspace and activity in both is announced by Paris ACC.

Additionally, the private pilot benefits from a new dispensation. Outside the intermediate contour, the three circles of 17km radius centred on Beauvais, Dreux and Evreux, and the zone shown at Pontoise, the lower limit of the Paris terminal control area has been raised from 300m to 500m above ground level. Provided a non-radio aircraft keeps clear of cloud it may fly freely in this part of the TMA with a forward visibility of only 1.5m. Elsewhere the TMA base remains at 300m; above this height non-radio aircraft must continue to have 8km forward visibility.

For example, at Toussus le Noble, the airport most used by air touring visitors from Britain, aircraft may climb to a height of 2,460ft QNH but must maintain VFR with 5 miles' forward visibility above 985ft. A special rule is that arrivals and departures must be made to the west of Route Nationale 306 between Le Christ de Saclay and Gil sur Yvette. There are a number of other special conditions for various parts of the area, and these are set out in a repromulgated translation of the French Notam and Information Circular, copies of which are obtainable from AIS, Pinner and, it is understood, from the Royal Aero Club.

Not much comment has been forthcoming from France about how the zone is working in practice; on recent *Flight* journeys into Toussus no special problems were encountered and no special briefing was given by the controllers.

Under consideration is an additional scheme for the introduction of an east-west lane through the central common reserved zone. It would be available to radio-equipped aircraft flying VFR. Two lanes have been considered, one passing between Orly and Brétigny and the other passing the northern edge of Orly. Since lateral and vertical limits would have to be very strictly observed, a system of ground marker beacons might be introduced to provide guidance where existing landmarks are insufficient. A similar proposal for visual marking has been advocated by *Flight* to define the limits of free lanes through controlled airspace in Great Britain.

Although all commercial traffic into Orly and Le Bourget will be operating IFR, these aerodromes are not closed to VFR aircraft. The French authorities have considered setting up, within the Paris control centre, a special sector to serve light aircraft, with its own VHF frequencies and land-line communication to small airfields. These channels would provide private pilots with information on weather conditions, runways in use and possibly of traffic density, but the sector could only have an advisory role because navigation of non-IFR aircraft is too inexact for a ground centre to exercise positive control.

It is immediately apparent that for the Paris experiment to work successfully the private pilots must fly accurate QNH altitudes and make sure that they know their position in relation to the zone and area boundaries. This has never been an easy matter near any control zone and the problem can only be sensibly tackled by making an allowance for positional errors. A self-imposed margin on altitude also seems essential, since there is no dead airspace at all between the upper terminal reserved area—in which jets will be operating IFR—and the airspace underneath which is reserved for light aircraft. Accurate altimeters and a sound knowledge of QNH are also required.

Another aspect of the Paris experiment which has caused some criticism is the way in which the zone changes shape with the day of the week. While it is probably logical that special arrangements should be made at weekends, the rules that apply on Saturdays and Sundays are in force on public holidays as well. How many people realize, for example, that public holidays in France fall this year on May 1, 11, 22, July 14, August 15, November 1 and 11 and December 25?

To sum up, in the air around Paris a real attempt has been made to apportion the air between the different types of user who fly in it. The three types of airspace are: (1) the commercial reserved zone and upper terminal area, to which access is forbidden without control clearance; (2) the upper layers of the lower terminal area, where forward visibility limits apply; and (3) the lower layers of the lower terminal area, where light aircraft may fly freely in about 1 n.m. visibility. Transport aircraft have been little curtailed, except possibly in climb-out at full load, where an indirect path may have to be followed to reach the upper area. Both airfield zones have climb-out gates to the north-east. In return for greater freedom for private pilots, careful position checking and much more accurate height-keeping are demanded. The lives of air transport passengers depend upon it. France has accorded private flying that responsibility.

A. T. P.

AIR COMMERCE

The second prototype Avro 748, G-ARAY, took off from Woodford on Monday, April 10, on its maiden flight. Piloted by Mr J. G. Harrison, Avro chief test pilot, the aircraft was airborne for about 40 min. The first 748, G-APZV—which first flew on June 24, 1960—has to date logged about more than 360hr. Certification target-date is July 1961

THE QUEEN WILL FLY BY VANGUARD

WHEN the Queen and the Duke of Edinburgh leave London on April 29 for their State visit to Italy they will fly in a BEA Vanguard non-stop to Decimo Mannu Airport, Sardinia, leaving Cagliari in the Royal yacht *Britannia* on May 2 for Naples.

On May 5 the Queen and the Duke will fly from Fiumicino Airport, Rome, to Ancona, returning to London Airport from Turin on May 9 by BEA Vanguard. For some journeys within Italy between May 2 and May 9 Her Majesty will use one of the Queen's Flight's Herons, the places to be visited including Venice, Florence and Milan. BEA does not normally fly to Decimo Mannu Airport, Sardinia; Viscount service is to Alghero Airport. A BEA Vanguard left London on April 11 for Decimo Mannu on a proving flight.

THAT HEATHROW NEAR-MISS

AT last the Ministry of Aviation has given an answer to one of the two questions that have been asked since the Heathrow near-miss on February 21: (1) Is the investigation complete? (2) Will the findings be published? Hitherto the answers have been, respectively, "No" and "It is not normally the practice to publish the findings of this type of investigation."

The Ministry now confirms that the investigation is complete. But it is not yet certain that the findings will be published; the Ministry said last week that the report had been submitted—according to accepted international practice—to the civil aviation authorities of the two countries concerned, the United Arab Republic and Canada. Until their reactions had been received it was not possible to say whether the report would be published.

On Tuesday, April 6, the day *Flight* published a leading article expressing the hope that the Ministry would not be secretive about this serious incident, the *Daily Mail* reported that "one of the airlines concerned, United Arab Airlines, had complained of Ministry delay" in reporting on the near collision between its Comet and the TCA DC-8 that had just taken off from Heathrow. The local manager of UAA, Mr I. H. Gazarine, was reported to have said: "We have written twice to the Ministry but have had no reply. We are very anxious to find out the result of the inquiry." The following day's issue of the newspaper reported that the Ministry had written to both UAA and TCA saying that the TCA DC-8 was 1,000ft higher than it should have been.

SO MUCH FOR COMMONWEALTH SPIRIT

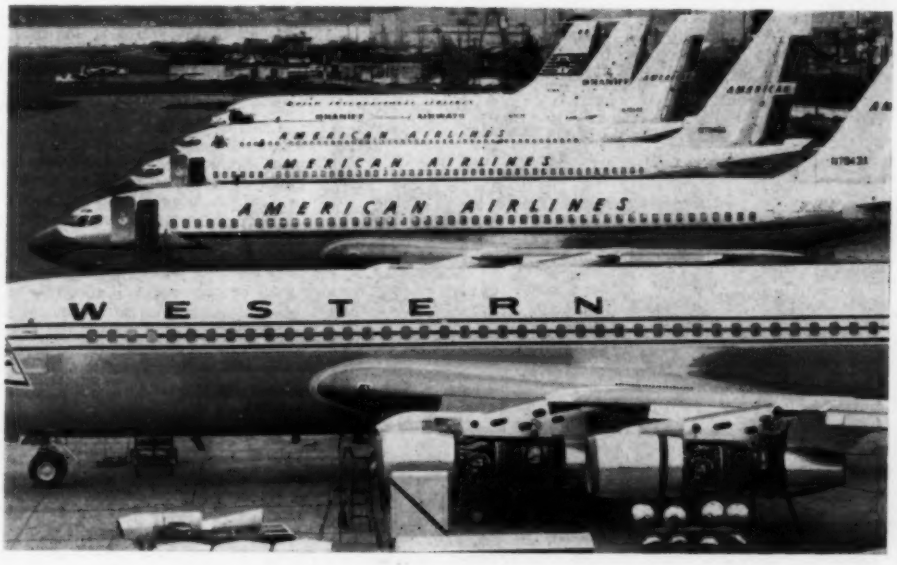
IN the eyes of ICAO the UK colonies are, for the purposes of air transport traffic rights, UK sovereign territory. It might then be reasonable to suppose that UK and Colonial airlines can trade relatively freely in these territories. But some of our Colonies place as many, if not more, restrictions on flights by UK aircraft than do some foreign countries.

Indeed, an agreement among 14 European countries, including the UK, makes it possible for a UK airline to make certain classes of non-scheduled operations without prior permission. These "certain classes" were summarized in *Flight* a year ago (April 15, 1960, page 545). Briefly, operators may, without permission, operate to the 14 European countries concerned flights which (1) have the entire capacity chartered by a single organization; (2) are single flights operated at a frequency no greater than monthly; (3) are all-cargo flights; and (4) which "transport passengers between regions which have no reasonably direct connection by scheduled air services." Certain detail concessions are made.

But even this limited freedom does not apply to British carriers who want to operate non-scheduled flights to British colonies. As recorded two weeks ago ("A Guide to Red Tape," page 455) the Ministry has just issued a helpful circular explaining the traffic rights situation for non-scheduled flights in Europe. The Ministry has now published another equally useful circular (No 37, April 5, 1961) explaining that "a permit or licence is normally required for the exercise of traffic rights in UK overseas territories."

Some of these territories, it appears, do not even (like the USSR) recognize the ICAO first and second freedoms of the air, and require prior permission for overflights and technical landings. These Colonies include Bermuda, Fiji, Gibraltar, Leeward Islands, Tobago, New Hebrides, British Solomon Islands, Gilbert and Ellice Islands, and Dominica. And *all* UK colonies normally require UK operators who want to operate non-scheduled traffic flights to submit in advance detailed requests for permission.

Some UK colonies actually require special additional information about non-scheduled traffic flights. Further guidance is available from the Ministry of Aviation (ACG4), Shell-Mex House, London WC2 (Temple Bar 1207, ext 297 or 769).



Seen here on the flight-test line at Renton, Washington, is this row of newly completed Boeing 720s—three "Bs" for American Airlines, one "B" for Western Airlines, a straight 720 for Braniff (their second), and one for Irish International Airlines (their third). Lufthansa took delivery of their first "B" just before this picture was taken, and on the assembly line are more 720s and 720Bs for these operators, with other aircraft for Eastern Avianca, Ethiopian and Northwest

"St Gall," the first Viscount V.808 delivered to Aer Lingus in May 1957, appeared at Dublin Airport in a new Easter outfit. The word "Viscount" has been deleted in favour of "Irish International Airlines"—presumably to present the corporate image of the Irish airlines to the United Kingdom and European markets. This must be the longest airline title on the world's air routes—including "Fly Eastern Golden Falcon Jet"

AIR COMMERCE . . .

AIR TRANSPORT AT OXFORD

EVERY year for the past six years the Royal Aeronautical Society has sponsored an air transport course, a three-week series of lectures embracing economics, operations and air law. The course takes place around Easter-time at Oriel College, Oxford, and is attended by 30 or 40 students. These might be described as "young senior executives," all sent by organizations diversely concerned with air transport.

This year's course, which took place between March 24 and April 15, was by all accounts one of the liveliest and most successful to date. The students, 34 in number this year, could be classified as follows (numbers in brackets indicate overseas students): from airlines, 14 (8); Government departments, 6 (2); manufacturers, 11; fuel companies and insurance, 3.

The resident lecturers, as in the past, were: economics, S. F. Wheatcroft; operations, K. G. Wilkinson (BEA) and D. C. Tennant (TCA); air law, A. R. Barrowclough. Also as in previous years, the director of the course was Dr A. M. Ballantyne, and the secretary Miss E. B. Croad.

It is customary for these courses to be addressed by guest speakers, and this year these were:—

Dr V. Gore, Air Research Bureau; Mr R. E. Hardingham, ARB; Sir William Hildred, IATA; Mr L. C. Hunting, president of BIATA; Mr Arnold Kean, assistant treasury solicitor, Ministry of Aviation Branch; Dr E. S. Moult, president of the RAeS and technical director of DH Engines; Mr J. D. Pearson, Rolls-Royce; Mr C. A. Seymour, Air-BP; Mr Basil Smallpeice, BOAC; and Capt J. Woodman, BOAC. Contributing to the course in addition to the resident lecturers were: Mr Frank Beswick; Mr Elliott Bolton, TCA; Mr B. M. Brough, BEA; Mr Tom Carter, American Embassy; Mr Robert L. Cummings, New York Airways; Mr E. J. Dickie, MoA; Mr G. Fitzgerald, Irish Air Lines; Miss M. Goldring, *The Economist;* Mr J. K. M. Henry, Scott and Wilson, Kirkpatrick and Partners; Mr C. H. Jackson, BOAC; Mr M. D. Morrissey, BOAC; Mrs Alison Munro, MoA; Mr R. Nivet, Air France; Dr K. R. Sealy, London School of Economics; Mr John Seekings, BEA; Mr H. E. Smith, BOAC; Mr R. Stoessel, Lockheed Aircraft; Mr P. L. Sutcliffe, Hawker Siddeley Aviation; and Mr D. A. Whybrow, Channel Air Bridge.

Because not many firms are able to spare executives for more than three weeks, and because air transport is nowadays so big a subject, maximum utilization of student work capacity is a keynote of the course. The average working week of more than 20 lectures, plus the case studies on which seminar groups get to work, calls for a working week of perhaps 50 or 60hr. The general consensus of opinion among students is that the pace is hard but that it could be relaxed only by dispensing with indispensable lectures.

The liveliness of the course obviously depends greatly on the personalities of the people attending. This year in particular proceedings appeared to go with a swing from the start. One of the case studies (in addition to an air law case involving a hypothetical collision) was Cunard Eagle's application to operate North Atlantic services—the actual application that is soon to come up before the Air Transport Licensing Board. The course was divided into two groups, each with its own "Board" and teams representing BOAC and Cunard Eagle. The fact that there were no representatives from these organizations no doubt enhanced objectivity, and the fulfilment of three weeks' work on the case by each group were the "hearings" and "board decisions" that took place on the last two days of the course—occasions notable as much for their wit as for their wisdom. For the record, both Boards granted Cunard Eagle's application, though with qualifications.

As is the tradition of these courses (which incidentally have now been expanded to include a separate short course for Commonwealth civil aviation authorities) the concluding event was the Bonally Dinner—attended by the president of the Royal Aeronautical Society—in the seventeenth-century hall of Oriel College.

This is an unusual picture for the Air Commerce pages of "Flight," but it is appropriate. At BEA's engineering base at London Airport work is proceeding with enthusiasm on the restoration of Nash Collection veterans by a spare-time group of 20 volunteers, including BEA engineers. In the foreground is an S.E.5, in the centre a Bleriot XXVII, and in the background an Avro 504

BEA N'A PAS RENONCE LE TRIDENT

THE March 31 issue of the French aviation journal *Les Ailes* included a mildly startling report to the effect that the British Government had decided that BEA will renounce the D.H.121 Trident and, "in the interests of close collaboration with the French industry," will order Caravelle 10s. The report announced that, in fact, BEA had ordered 30 Caravelle 10s and had placed an option on a further 30. The story is fantasy, needless to say—but it does focus interest on the new Caravelle 10, about which more information has now been made available by Sud.

As yet a project, the Caravelle 10 is a development with two JTD8-1s of 14,000lb static thrust each. Take-off weight is 114,640lb and payload-range performance is 1,900 n.m. with 17,600lb of payload and 7,590lb of fuel in reserve. With payload reduced to 13,150lb and the same fuel reserve, stage goes up to 2,100 n.m.

Take-off distance at maximum take-off weight is 6,650ft and CAR landing distance at a landing weight of 89,287lb is 4,462ft. Speed performance is not significantly different from other Caravelles, VNO being 320-390kt. Estimated price is quoted at between $3m and $3½m.

Dimensions of the new US turbofan-powered Caravelle, which is reported to be arousing the interest of American Airlines and United, are the same as previous versions, with the exception of the Caravelle 7. That version, which is also aimed at the American market (being fitted with GE CJ805-23C turbofans of 16,100lb), has its fuselage-length increased by 3ft from 105ft to 108ft, all this increase being available in the cabin. The Caravelle 10 has the standard length of 105ft.

A SHOCK FOR THE BUSES

SOME comments on the Air Transport Licensing Board are forthcoming from a non-aviation quarter—from the journal *Bus and Coach*, which is one of *Flight*'s associated publications. In its April 5 issue, in an article advising road operators to keep a watchful eye on air-service applications, *Bus and Coach* comments:

"When the Board held its first sitting the handful of road transport men who went along to see the procedure adopted were a little shocked at the lack of formality. No one stood when the Board assembled, all statements were made when seated, objections were heard before the applicant's case was presented, allegations of all kinds of irregular practices were made without any attempt to prove them, documentary evidence beyond that given in advance of the sitting was not presented, and no attempt was made to prove such suggestions as that the licensing of a particular facility would mean wasteful competition.

"I mention all this just to warn road operators what to expect. My advice, however, is to go before the Board just as well-documented and briefed as if they were going to a particularly sticky public sitting before any of the Traffic Commissioners. The Board is likely to get more formal as time goes on. Even if it does not do so, a well-prepared case is always much more impressive than one poorly put together. The big airlines are likely as time goes on to spend big sums on the services of top-rank legal men."

When the big jets were first proposed six years ago it was suggested to Douglas that the runways at New York International might have to be extended into Jamaica Bay. A representative was quoted as saying, "All right—so fill up the lousy bay." Although this has not been necessary so far, plans are now in hand—as this picture shows—for Idlewild to be "updated" by extending the runway system into the bay

THE BIG HEARING POSTPONED

POSTPONEMENT of the date set for the Cunard Eagle North Atlantic case is announced by the Air Transport Licensing Board. Originally to have started on Tuesday of this week, April 18, the hearing has been "postponed to a date yet to be decided." The reason, it is believed, is that the new chairman, Prof D. T. Jack, wishes to take the chair at this important meeting—the most important to-date—and would like to have more time for their necessary preparations.

Among a list of new applications for inclusive tours published in the Board's *Civil Aviation Licensing Notices* No 17 is one from BOAC for a winter-sports service from London to Zurich, starting next December and continuing at a weekly frequency until late March. It remains to be seen whether any objection will be lodged by BOAC's sister corporation; BEA might well feel that their European inclusive-tour business is not for sharing with BOAC.

Among the applications granted by the Board, as recorded in the same edition, is the one that was put in by BEA for the right to include Birmingham as an additional optional stop on its Manchester - Milan service. Permission to operate Comets as well as Vanguards has been granted, though not BEA's application to operate Tridents. The hearing was summarized in *Flight* for April 6 (page 454 "Dogs in BEA's Manger"). The application had been opposed by Cunard Eagle and by British United.

BATTLE OF THE BAHAMAS

A NUMBER of significant events have taken place since, last December, Mr Eric Rylands of Skyways sold back to BOAC the majority interest in Bahamas Airways that he and David Brown had bought 18 months previously. As we remarked at the time (*Flight*, January 13, page 67) this move was surprising in the light of the BOAC Associated Companies' policy to dispose of, rather than to acquire, financially burdensome subsidiaries.

Mr Rylands was confident early last year that his new investment was going to prove profitable; he said in January 1960 that the Bahamas as a tourist resort "will eventually become an extension of Florida." In February 1960 the new Bahamas Airways introduced two ex-Skyways Hermes 4s, luxuriously appointed at a cost of more than £15,000, into service on the routes from Nassau to Miami, Fort Lauderdale and West Palm Beach—all rich tourist centres in Florida whence holiday-making Americans like to make the "side trip" to the Bahamas.

What was the reason for the failure of this private enterprise venture and for BOAC's rescue operation? The reasons are not easily pinpointed, but one is certainly BOAC's desire to protect its traffic rights. It was thought that BOAC's 20 per cent share was (we quote Sir George Cribbett at the time) "sufficient to safeguard our interests." But this was evidently an assumption made on the basis of a thriving Bahamas Airways, and it is necessary to probe a little more deeply. Undoubtedly stiff competition for Bahamas Airways was provided by Eagle, whose Bahaman subsidiary—against strong opposition from Bahamas Airways—was licensed by the Colony to operate parallel services to Miami. These began shortly after Bahamas Airways' revitalized Hermes services, and were operated with Viscount 707s chartered from Eagle Airways Bermuda. Cunard Eagle Bahamas was allowed by its US foreign carrier permit to operate only to Miami, and not to Fort Lauderdale and West Palm Beach. Nevertheless its Viscount services provided stiff competition on the route to Miami, and a fares war developed. Eagle reduced the return tourist fare from $33 to $23, forcing Pan American—the competing US carrier on the route—to do the same. It is probable also that the passenger appeal of the Viscount, notwithstanding the luxurious appointments of the Hermes, gave Eagle a competitive edge. Bahamas Airways asked permission to increase fares during the tourist season (December-April), since it was believed that the American tourist market could stand such an increase, but this was refused.

Bahamas Airways had never been happy about the licensing of a second Bahamas airline, especially as the newcomer, Eagle, was not burdened by the inter-island social services operated on a subsidy by Bahamas Airways DC-3s and smaller types. Mr Rylands had hoped, for reasons reviewed in *Flight* for January 13 1961, that the Bahamas Government would increase this social subsidy once the airline was no longer in BOAC hands. But although such a subsidy was recommended to the Bahamas Government by independent assessors, it was never forthcoming. And to aggravate the situation, there were increases in wages of about £50,000 a year which Bahamas Airways felt were forced on it by the Bahamas Government.

Now it is learned that the US Government has amended Cunard Eagle's foreign carrier permit to include also Fort Lauderdale, Tampa and West Palm Beach, thus allowing it to double-track with Bahamas Airways the routes to these rich sources of American tourists. This is in spite of the opposition of Mackey Airlines, who operate DC-4 services linking these points and Miami with Nassau. Yet another new move is the reported decision by BOAC Associated Companies to transfer the three Viscount 702s operated by Kuwait Airways (who may take over three of MEA's Viscount 745s) to Nassau for operation by Bahamas Airways. It appears that BOAC does not intend to let Bahamas Airways and the US traffic rights that it enjoys fall by the wayside.

Whether or not Cunard Eagle are making money is a matter for speculation. One thing is certain: Eagle's presence has certainly been a factor in Bahamas Airways difficulties, and it will be felt increasingly now that the airline has got its long-sought additional rights in Florida.

DC-8F FOR FREIGHTER

FIRST official Douglas suffix to the DC-8 is "F"—for freighter. Douglas have just announced this new cargo-passenger version of the DC-8 (which may be called the Trader), and it will reportedly fly in August 1962 with deliveries to airlines scheduled for the end of 1962. The powerplant will be JT3D-3 turbofans, and the project would appear to be a version of the standard commercial DC-8-50, though with considerably greater payload. No information is available as yet about door-sizes; it can be assumed

BOAC have just placed an order with Standard Telephones and Cables Ltd for an electronic ticketing system to provide the corporation's ticket offices in the UK and Europe with up-to-the-minute information on the availability of seats. Here a BOAC reservations girl "interrogates" her key set so that she can give the customer a quick answer on space-availability. The central store of flight information is at BOAC Airways Terminal, Victoria; at first the system will serve about 100 sales personnel within the building, being extended next year to other UK centres and later to European cities. Cost will be about £325,000

Dr Adenauer, the West German Chancellor, baptizes Lufthansa's first Boeing 720B at Frankfurt on April 11. Shortly afterwards the aircraft, "Bonn," flew him to Washington for his talks with President Kennedy

AIR COMMERCE . . .

that, unlike the unofficial 350,000lb DC-8A which was projected as a contender for the MATS big jet freighter contract, the DC-8F will not have a swing tail. Data are as follows:—
Powerplant: Four Pratt & Whitney JT3D-3 turbofans of 18,000lb static thrust each.
Dimensions: As DC-8 (see *Flight*, November 18, 1960, page 803).
Weights: Maximum take-off, 310,000lb; payload (space-limited) with 54 passengers, and cargo at 10lb per cubic foot, 62,610lb.
Payload accommodation: Forward 60 per cent of the cabin, freight (up to 52,000lb); aft section, passengers (54). The freight compartment would have provision for nine 81in × 110in freight pallets.

AFTER THE CRASH

SOME heart-searching must have been done by the Ministry of Aviation before it agreed to co-operate with the BBC in last Thursday's TV programme about investigating accidents. The subject is a "natural" for dramatization, but there is always the fear that the over-dramatization of disaster will raise unnecessary doubts about air safety. In the event the Accidents Investigations Branch probably felt quite relieved at the way the feature turned out.

The accident involved a "Cardinal" aircraft which inexplicably went in at the end of a GCA. Witnesses talked of "explosions" and "fire in the air"; the Ministry inspector's comment was to the effect that witnesses' fire tales are usually fairy tales. The co-pilot survived (the captain died of his injuries) and spoke of "a bang" and of a "sharp bank to port" which he couldn't hold. Pilot-viewers will have been delighted at the heavy emphasis put on the blaming of pilots by accident investigators: "This is one they couldn't pin on us," the co-pilot remarked. But the Ministry team seemed pretty well aware of this particular pilot prejudice, and in any case they found what they were after in the wreckage (or rather a Boy Scout did)—a flap bracket that had obviously suffered a fatigue failure.

Passages were a bit theatrical—some of the remarks were not *quite* typical of real-life chief pilots, company safety officers, and senior ATCOs. But the script-writer, Wilfred Greatorex, did a skilful job. His story seemed to have been largely inspired by the Viscount accident at Manchester in 1957.

JAM YESTERDAY

SHAREHOLDERS in the world's largest airline—and that, of course, is American Airlines until such time as United and Capital are finally merged—must feel like Alice in never being able to enjoy jam today. Despite the great promises made a few years ago, when the first generation of jets was about to come into service, their investment has shown a steadily diminishing return. The main message of the recently published report for 1960 is to ask shareholders to wait patiently until the fan-engined second generation of jets gets into its stride.

Even if they can find little evidence of improved earnings, shareholders can at least rejoice over the dominating position that their airline has achieved. To read through American's annual report is to venture into a world of genuine superlatives.

Last year saw them selling services valued at as much as $428m (£153m). Their fleet numbered close on 200 aircraft. The number of staff at the year-end stood at 24,000. And the volume of their traffic over the year was equivalent to one-tenth of the total for all the world's airlines put together—or, expressed in another way, rather more than the total domestic and international traffic carried by all airlines within Europe.

Despite their Olympian stature, American Airlines last year were unable to fly above the financial turbulence that so troubled the industry as a whole. Although their revenues were up by 13 per cent, net profit was down from $21m to $12m. Indeed, if the system of depreciation had not been changed (mainly in the form of an extension of estimated useful life of jet aircraft to 12 years), net profit would have been reduced by a further million dollars. The explanation for this does not require much seeking; seat load factor toppled from 70 to 65 per cent.

Reduced load factors were, of course, a prominent feature of the North American industry as a whole last year (the average fell below 60 per cent for the first time since 1949). This resulted from an unfortunate contraction in the national economy at a time when substantial fresh capacity from new jet fleets was becoming available. As American's report declares: "A high percentage of [our] traffic comes from business travel." American Airlines feel that the policies adopted by the regulatory authority have not made life easier in this respect: "All of the industry, including American, continues to suffer from the effect of too much parallel duplicating airline service authorized by the CAB."

Another problem which must have affected American's load factor, although no reference is made to it in the report, was the speed restriction and adverse publicity suffered by the Lockheed Electra last year (American has 33 aircraft of this type). If load factors had not fallen, American's results would have been gratifying; revenue rates were up slightly and unit costs were down (from 31 to 30 cents per c.t.m.). An important factor behind this cost-reduction was the high utilization of the company's 34 Boeing 707s—up from 7hr 45min in 1959 to 9hr 27min in 1960.

Although the net return on investment dropped to as low as 6 per cent in the case of American last year, the average for all the trunk operators is estimated to have fallen as low as 3 per cent. American's policy towards retiring used aircraft has played a significant part in achieving their above-average record, for not only does this company continue to make a profit on the sale of used equipment (albeit less in 1960 than in 1959), but the rate of retirement has been such that "American does not now have any idle aircraft in storage (and) all of those available for delivery have been sold."

Looking at the future, the report concentrates entirely on the *Astrojet*, the name coined to describe American's fan-powered Boeing 707s and Convair 990s. The sceptical shareholder reading about this generic equipment might be excused for recalling the good old DC-6 days when American's net return on investment stood as high as 13 per cent. Alice would have sympathized with him.

BACK TO CIAMPINO?

OPERATIONS from Rome's new international airport at Fiumicino are *not* to be suspended as a result of subsidence of the main runway, but this runway, 12,990ft, has been out of service for repairs for two weeks. During this time the secondary 8,630ft runway (6,100ft serviceable) has been used.

As reported in *Flight* for January 20, one of the many criticisms of the new airport is that it is built on unstable land, and the main runway continues to crack and subside despite repairs. It will be open again tomorrow, April 21, but for only 85 per cent of its length.

Italian workmen are seen here at work on repairs to the main runway at Fiumicino, which, it is reported in a note on this page, is continuing to suffer from subsidence troubles. Complete sections of concrete are being removed, the soil compacted, and the concrete renewed

GUILD BANQUET

(continued from page 526)

two models and some representatives of the two airways corporations. "The trouble that one of these aircraft is causing," he said amid laughter, "and the trouble that the other is about to cause makes me wonder whether the corporations wouldn't settle for a box of pipes any time." Sir George imagined that the Guild in 1929 would have been "pretty shattered at the thought of shooting along at 1,500 m.p.h." He added, "in brackets," that the aircraft concerned would be British. From what he had seen of the Guild, and "the way they go on, they are a pretty responsible lot." He hoped that the Guild would "never get mixed up with trade unionism." Working committees had, he said, led the Guild into proposing unified ATC. Of its test-pilot members: "they are the only people in this business who risk their necks." As for Prince Philip, there was no doubt about his airmanship. "In my chequered career," he said, "I have always thought it a good thing to have another career to fall back on," and the Duke could qualify as an airline pilot any time—but "happily I can't see any danger of our becoming a republic." Sir George then deplored "misinformed newspaper criticism" of the way the Duke uses the air—criticisms which could not be answered.

In reply, the Duke of Edinburgh declared that Sir George had made his kind remarks "entirely of his own free will, even though I am Grand Master." The Mayor also had said some kind things about him—"it seems such a pity he has already been elected." While airline passengers diligently worked their way through meals and snacks, "no doubt designed to show that one airline was better than another," and while the pilots and navigators were wrestling with the controls, this banquet showed that pilots and navigators *did* eat and drink. Aviation, to coin a phrase, was going places—"though it isn't always clear to which place it is going." So far as the aircraft industry and its mergers were concerned, "it must take a little adjustment to have your left heel grafted on to your right ear." As for the corporations, it appeared that "all sorts of people are trying to pinch the growth of both corporations' traffic." But, he said, "I can appreciate the point of view of both sides."

The Master, Dr K. G. Bergin, proposing the guests, expressed his appreciation of Sir Miles Thomas, who replied to the toast. Sir Miles, the former chairman of BOAC, thought that British aviation owed a lot to its wives, all of whom had obviously been carefully selected. He had also, he said, made a design for a tie for ex-chairmen of BOAC—"two hardened arteries on a field of frustration."

Here is the British United Whirlwind which, as reported last week (page 461) flew from Redhill to West India Dock for shipment to Trinidad, where it is to work under contract to the Dominion Oil Co. The pilot was Mr A. E. Bristow, executive director of BUA's helicopter division

AUSTRALIAN FLIGHT RECORDERS

As a sequel to the TAA accident last year in which a Friendship crashed into the sea off Mackay, Queensland, flight recorders are to be installed in all Australian airliners. These will provide a permanent record not only of instrument readings but of cockpit conversations.

The board which investigated the accident was unable to reach any firm conclusion as to the cause. They recommended the installation of flight recorders.

Announcing this as a mandatory requirement, Australia's Minister of Civil Aviation, Senator Paltridge, said that the recorders would have a device to erase automatically all recordings of cockpit conversations at the end of a successful flight. No date for installation has yet been set and the type of equipment to be used has still to be agreed between the airlines and Australia's aeronautical research laboratories. Another result of the accident is that standard visual descent procedures are to be developed by the airlines and the Department of Civil Aviation. The Friendship static system is also to be modified. The first kits will become available in May and all Friendships operating in Australia should be modified by August.

BREVITIES

A DC-3 of the Chilean airline LAN was reported missing on April 4 on a flight from Punta Arenas, Chile, to Santiago. There were 24 passengers on board.

Replying to a question in the Commons on April 11, Mr Thorneycroft, Minister of Aviation, said that expenditure on London Gatwick up to December 1960 was £8m.

Just appointed sales manager in the UK for Trans-Australia Airlines is Mr J. B. G. Hulton. He takes up his new appointment on May 1. Mr Hulton has been with TAA since its inception in 1947.

Mr H. P. Snelling, formerly general manager (commercial) of Skyways, has been appointed general manager, Bermuda and Nassau, for Cunard Eagle Airways (Bermuda) Ltd. He takes up his new post on May 1.

The recent jet airliner price increases announced by Boeing apply only to the 720B and 707-120B versions, and the increases range from 4.7 to 7.5 per cent. These come into effect on May 1. The prices of other Boeing 707s and also the 727 ($4.25m) are not affected.

BOAC's insurance problem has now been resolved. The jet fleet of Comets and 707s, and passenger risks, continue to be carried, as before, by the London market. BOAC say that a satisfactory agreement has been reached with their brokers. The remainder of the fleet, the Britannias and DC-7Cs, will now be carried at the corporation's own risk.

According to provisional estimates just published by the Ministry of Aviation, UK airline traffic in February 1961 shows a sharp drop in load factor on scheduled and inclusive tour services, from 57 to 52 per cent. Capacity increased by 27 per cent whilst traffic load ton-miles went up by 16.7 per cent.

May 1 is the date on which IATA will meet to try again to reach agreement on new North Atlantic cargo rates. The meeting will take place in Montreal, with Mr H. B. Renwick of CPAL presiding. The threatened rate-war that was to have broken out on April 10 was, as already reported, averted by an agreement extending existing rates until June 30.

Cathay Pacific announce that they have opened a sales office in London at Dunster House, 17-19 Mark Lane, London, EC3. The Hong Kong airline also announces that its two Lockheed Electras have been returned by Lockheed after modifications. (A recent note in these pages to the effect that Cathay Pacific has decided to purchase Boeing 720s is not, we are informed, correct.)

On May 1, two years after the inauguration of BEA-Aeroflot services between Moscow and London, each carrier will increase the frequency of its jet services to three round-trips per week each.

TWA earned a net profit of more than £2.3m in 1960 on total revenues of nearly £118m. This compares with a profit in 1959 of £3½m. TWA's international operations made a profit in 1960, though domestic operations lost.

According to *Interavia*, the president of Austrian Airlines, Dr Joseph Koller, has said that his company will order medium-haul jets to take over Viscount routes. The choice, it is said, is expected to be the Caravelle.

Boeing announce a new order for the 720 from Pacific Northern Airlines of Seattle, Washington. The airline has purchased two for delivery in the spring of next year. This brings the total number of Boeing 707/720 jet airliners on order to 274.

IATA's symposium on supersonic aircraft began in Montreal on April 17, with Mr. R. V. Carleton, of Braniff Airways, as chairman of the technical conference. Mr Jack Dyment of TCA was chairman of the symposium, with Mr Clifford Jackson of BOAC as vice-chairman.

BEA's total capacity this summer on international and domestic routes will be carried as follows (percentages): Comets, 25; Vanguards, 13; Viscounts, 60; chartered etc, 2. By next winter Comets and Vanguards will each be providing about 30 per cent of the corporation's total seat-miles.

A successor has been found by IATA for Mr John Brancker, who resigned as traffic director last summer after a difference of opinion with the director-general, Sir William Hildred. The new man is Mr H. Don Reynolds, assistant vice-president and formerly general traffic manager of American Airlines. He has left American Airlines and took up his new post on April 17.

The recent amendment of BOAC's US foreign carrier permit making Philadelphia, Baltimore, Washington and Boston transatlantic terminals gives BOAC the right to operate from these points, as well as from New York, to Bermuda. However, permission is not granted for Philadelphia, Baltimore, Washington and Boston to be linked directly with the Bahamas or Jamaica. Meanwhile the CAB Examiner recommends that BOAC be permitted to extend its New York - Bahamas route to Lima and Santiago via Cuba, Jamaica, Panama, Colombia and Ecuador.

Maj Asim Tugel, CO No 141 Sqn, Turkish Air Force, alighting from his F-86E Sabre at RAF Akrotiri after leading a formation of 12 Turkish F-86s (including aircraft from Nos 142 and 143 Sqns) to Cyprus on a recent goodwill visit (this page, April 6)

SERVICE AVIATION

Air Force, Naval and Army Flying News

NATO Integration

UNITS of RAF Fighter Command are to be assigned to NATO from the beginning of next month. This was stated in Parliament last week by the Minister of Defence, Mr Harold Watkinson, who said he would be giving Gen Norstad formal notice of their assignment. It follows the announcement at the end of last year (*Flight*, December 30, 1960) that the Command would come under the orders of the Supreme Allied Commander Europe.

Mr Watkinson said that the SACEur-assigned units would be the air defence fighter squadrons and "the operational units of the Bloodhound Mk 1 SAGW system and of the control and reporting system." Air Marshal Sir Hector McGregor, Fighter Command AOC-in-C, was being nominated for appointment by SACEur as commander of the UK air defence region.

Whitehall/Norfolk Moves

TWO air vice-marshals are to exchange posts in June. At the beginning of the month AVM R. N. Bateson, DSO, DFC, is to become AOC No 12 Group, RAF Fighter Command, at Horsham St Faith, near Norwich. He has been ACAS (Operational Requirements) since September 1959, and will be succeeded in that post by AVM C. H. Hartley, CBE, DFC, AFC, who has been AOC No 12 Group since August 1959.

AVM Bateson led Mosquitos of No 613 Sqn on the famous precision attack on Gestapo headquarters in The Hague in April 1944, a year later leading similar attacks against Gestapo h.q. in Copenhagen and Odense. AVM Hartley flew with Beaufighter squadrons and commanded the Fighter Interception Unit at Ford, in 1943 carrying out operational trials on the first Junkers Ju 88 to fall into RAF hands.

ASR Re-deployment

NEW arrangements have been made for ASR coverage by helicopter units of Coastal Command, following the closure of RAF Felixstowe. The No 22 Sqn detachment which has been operating from there is moving to Tangmere, and an additional detachment is being formed to operate from Manston in Kent. The latter will now cover the Felixstowe area, with the No 228 Sqn detachment at Horsham St Faith near Norwich. These changes ensure coverage along all the southern coast of England. Other coverage is provided by the No 22 Sqn detachments at Chivenor and Valley in the west, and No 228 Sqn units operating from Acklington in Northumberland and Leuchars at Fife. Re-equipment of both the ASR helicopter squadrons with Westland Whirlwind HAS.10s is to begin later this year. During the 12 months ending August 31 last year, aircraft of the two squadrons flew a total of 410 rescue missions and 181 abortive searches. They evacuated 62 casualties (mostly civilians) and carried out 57 live rescues from land and sea during a total of 7,120hr flying.

Logistics Post

HAVING been until recently with the Logistics Division at Allied Forces Central Europe headquarters, Air Cdre L. A. Jackson, CBE, has been appointed Director of Logistics (Forecasting and Planning) at Air Ministry. Aged 49, he has been an equipment specialist since he was commissioned in the RAF in 1936; before going to AFCE he was Senior Equipment Staff Officer at Technical Training Command.

Pakistan Round Trip

A VULCAN of No 617 Sqn last week flew non-stop to Karachi and back from its base at Scampton. Total time for this 8,500-mile out-and-return trip, at an average speed of 500 m.p.h., was 17½hr. The aircraft was captained by Sqn Ldr M. G. Beavis.

Vulcans have previously made non-stop return flights to Kenya. This sortie to Pakistan, on which the aircraft was refuelled by Valiant tanker of No 214 Sqn, was the longest accomplished to date. It was carried out "above 40,000ft," though the Vulcan descended to above 30,000ft for refuelling. The aircraft carried its normal five-man crew plus a crew chief.

First meeting of the commanders of the RAF, RCAF and USAF air transport forces, at Trenton, Ont, recently. Left to right, Air Marshal Sir Denis Barnett, AOC - in - C RAF Transport Command; Air Cdre F. S. Carpenter, AOC RCAF Air Transport Command; and Lt-Gen Joe W. Kelly, Commander of MATS, US Air Force

IN BRIEF

Units of the Indian Air Force celebrated on April 1 the 28th anniversary of the formation of the IAF.

A ceremony on board HMS *Hermes* in the Indian Ocean on April 9 commemorated the loss by enemy action on that date in 1942 of the previous HMS *Hermes*. The present carrier is the tenth ship of the Royal Navy to bear that name.

Gp Capt G. I. Carmichael, DSO, AFC, RAF (RET), who commanded No 18 Sqn in 1915, is to be a guest at the ceremony at RAF Finningley on June 6 when Princess Margaret presents the squadron with its standard.

Sea and mountain rescue techniques are to be demonstrated in "Search and Survival by the RAF," the principal Royal Air Force display at the 1961 Royal Tournament (Earls Court, London, May 31 to June 17).

The RAF Benevolent Fund spent £527,979 last year on the relief of distress among serving and ex-service members of the RAF and WRAF and their families and dependants.

Two plaques to the memory of Lawrence of Arabia are being erected at the Pakistan Air Force station Drigh Road, Karachi. One will be in the workshop where he was employed and the other in his former billet.

A total of 1,600 young men—450 to train as aircraft apprentices, 50 as administrative apprentices and 1,100 boy entrants—is required by the RAF in September. Any RAF careers information centre will give advice on conditions of entry and service.

RAF, Pakistan Air Force and USAF aircraft provided "aggressor" forces last week in a CENTO (Iran, Pakistan and Turkey region) air defence exercise, Shahbaz IV, held from April 11 to 13. Iranian, Pakistan and Turkish Air Force aircraft were the defenders.

RAAF crews are being sent to the Lockheed factory in California for training on the Neptune P2V-7 aircraft with which No 10 Sqn is being re-equipped. The Minister for Air, Senator H. W. Wade, said recently that the last of the remaining Lincolns with which the squadron has been equipped are being withdrawn.

Cadets from the RAF College, Cranwell, have been both east and west during their Easter vacation. A party of 77 visited the United States, six went to Kenya to take part in the Kariba Dam animal rescue operation (Operation Noah) and another seven took part in a filming expedition in the Makindu area of Kenya.

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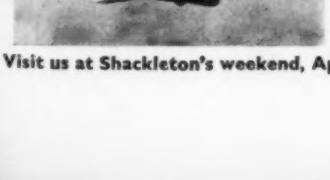

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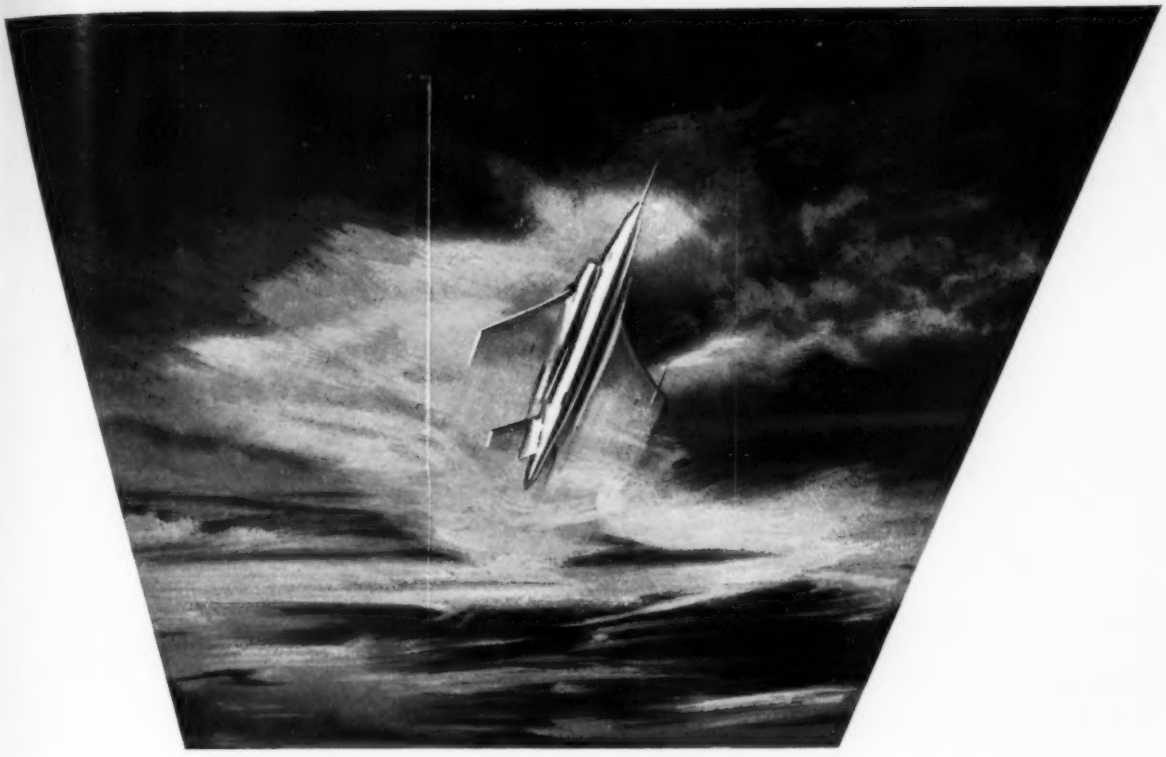

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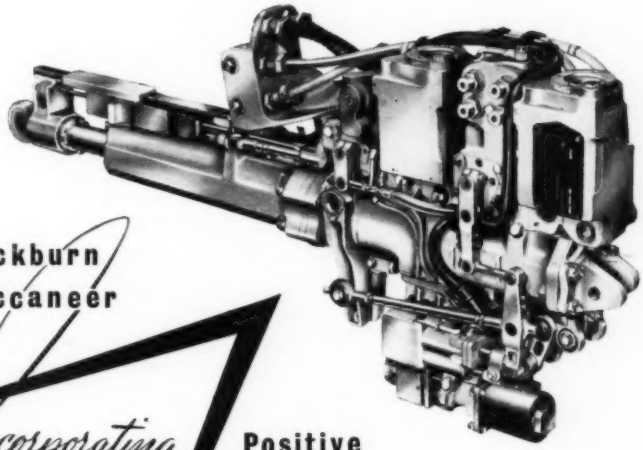

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